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IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel,)	
W.A. DREW EDMONDSON, in his)	
capacity as ATTORNEY GENERAL)	
OF THE STATE OF OKLAHOMA,)	
et al.)	
)	
Plaintiffs,)	
)	
V.)	No. 05-CV-329-GKF-SAJ
)	
)	
TYSON FOODS, INC., et al.,)	
)	
Defendants.)	

REPORTER'S TRANSCRIPT OF PROCEEDINGS
MARCH 11, 2008
PRELIMINARY INJUNCTION HEARING
VOLUME VIII

BEFORE THE HONORABLE GREGORY K. FRIZZELL, Judge

APPEARANCES:

<u>For the Plaintiffs:</u>	Mr. Drew Edmondson
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Glen R. Dorrough
UNITED STATES COURT REPORTER

1 THE WITNESS: My name is Timothy Joseph Sullivan.

2 THE COURT: Mr. George, you may inquire.

3 MR. GEORGE: Thank you, your Honor. I've handed Mr.
4 Overton, I believe he's passed up the demonstrative exhibits we
5 intend to use with this witness. I've provided copies of those
6 to opposing counsel as well.

7 DIRECT EXAMINATION

8 BY MR. GEORGE:

9 Q. Dr. Sullivan, could you briefly describe for the Court
10 your educational background?

11 A. I have a bachelor's degree in history from Stonehill
12 College in Massachusetts, master's in biological sciences from
13 Western State College of Colorado, a PhD in biological sciences
14 from Oregon State University in an interdisciplinary program
15 that involved three majors of focus, environmental chemistry,
16 ecology and zoology. I conducted two years of post-doctoral
17 research in Oslo, Norway on aluminum biogeochemistry.

18 Q. What has been your recent research focus, sir.

19 A. My focus is on the effects of human activities on the
20 environment, with a particular focus on water quality. I'm
21 also involved in research and assessment activities,
22 environmental assessment and ecosystem restoration work.

23 Q. Have you had occasion to publish in peer reviewed journals
24 the results of your work?

25 A. Yes. I've published approximately a hundred peer reviewed

1 publications. These include books, scientific journal
2 articles, book chapters, peer reviewed technical reports.

3 Q. Have you had an opportunity to publish anything that you
4 believe is particularly pertinent to the areas that you're
5 addressing in this case?

6 A. Yes. I think the two most pertinent publications would be
7 a recent publication that focused on collection of edge of
8 field samples from pastureland that had been amended with dairy
9 cow manure and quantifying the fecal indicator bacteria
10 concentrations in those samples. I also conducted a study that
11 was a demonstration project on agricultural land working with
12 farmers to change management practices and some of the
13 structural issues on farms and then collecting water quality to
14 determine how much the levels of fecal indicator bacteria
15 improved subsequent to the work on the farms.

16 Q. Dr. Sullivan, where are you currently employed and what
17 position do you hold?

18 A. I've been the president of ENS Environmental Chemistry,
19 Inc., for the past 20 years. It's located in Corvallis,
20 Oregon.

21 Q. What type of clients does ENS Environmental represent?

22 A. We represent a lot of governmental and industry clients.
23 My research is primarily for federal agencies, including the
24 U.S. Environmental Protection Agency, National Park Service,
25 USDA Forest Service, watershed councils and other stakeholder

1 groups, work for various state agencies.

2 Q. Dr. Sullivan, with respect to your work in this case, what
3 type of information or data or work product have you reviewed?

4 A. Well, I've looked at the database that was collected for
5 the State in this case, the water quality data primarily. I've
6 looked at publicly available water quality data. I have read
7 the written testimony, the affidavits of Dr. Teaf, Dr. Harwood,
8 Dr. Fisher, Dr. Olsen. I've also listened to the testimonies
9 of all of those individuals except for Dr. Olsen. I also
10 listened to the testimony and read the affidavit of Dr.
11 Caneday.

12 MR. GEORGE: Your Honor, if I could have permission to
13 lead for just a moment? I want to provide some structure of
14 what's to come.

15 THE COURT: Yes.

16 Q. (By Mr. George) Dr. Sullivan, were you asked to evaluate
17 the question of whether there is a statewide correlation
18 between poultry production areas and fecal indicator bacteria?

19 A. Yes, I was.

20 Q. Were you also asked to evaluate the potential for sources
21 other than poultry litter applications to impact fecal
22 indicator bacteria levels?

23 A. Yes.

24 Q. Were you asked to examine water quality data to determine
25 if the exceedances of water quality standards occur at times

1 and in places where there are substantial opportunity for
2 recreational exposure?

3 A. Yes, I was.

4 Q. Were you asked to evaluate whether the data collected by
5 the State in this litigation is reliable and representative of
6 the conditions in the Illinois River Watershed?

7 A. Yes.

8 Q. Dr. Sullivan, with respect to the first of those, did you
9 conduct an analysis of fecal indicator bacteria statewide as
10 compared to the Illinois River Watershed?

11 A. Yes, I did.

12 Q. And have you prepared some exhibits that might help you
13 explain how you went about that analysis and the conclusions
14 that you've drawn from it?

15 A. Yes.

16 Q. Can we go to Demonstrative Exhibit 4, please?

17 THE WITNESS: Your Honor, may I approach the screen
18 here?

19 THE COURT: Let me ask you, Dr. Sullivan, you're not
20 related to ENSR International, are you?

21 THE WITNESS: No, sir.

22 THE COURT: My sister is a hydrogeologist with them.

23 MR. GEORGE: With them, sir. Great firm.

24 THE WITNESS: Well, this is a map of the state of
25 Oklahoma showing the Illinois River Watershed over here on the

1 eastern side, and what we have coded is the stream reaches that
2 are listed as a 303(d) on the 303(d) list for the state of
3 Oklahoma for the year 2004. And the listings are color coded
4 based on whether a stream reach is listed for Enterococcus, or
5 E. Coli, or fecal coliform bacteria. So the yellow lines
6 indicate the listings for Enterococcus. The darker thin lines
7 are for E. Coli and then the whiter pinkish lines are for fecal
8 coliform bacteria. So there are some stream reaches that are
9 listed for two or three of those parameters; other stream
10 reaches that are listed for just one. But what we see is a
11 general pattern of widespread listings throughout the state.
12 There's no indication that the listings in the Illinois River
13 Watershed are really different from what we see statewide.

14 Q. Dr. Sullivan, did you also evaluate the areas in the state
15 of Oklahoma that have more intensive poultry production?

16 A. Yes, I did.

17 Q. Let me refer you to Demonstrative Exhibit 5. Is this a
18 map that you prepared, Dr. Sullivan?

19 A. Yes, it is. Again, it's a map of the state of Oklahoma,
20 and it's color coded by the densities of poultry from the
21 agricultural census information. The darker colors indicate
22 higher densities of poultry. And what this illustrates is that
23 poultry numbers are largest in the eastern part of the state
24 and are much lower in the west.

25 Q. Dr. Sullivan, moving away from just the existence of

1 impaired segments, did you consider on a statewide basis the
2 levels of fecal coliform indicators?

3 A. Yes, I did.

4 Q. Let me refer you to Demonstrative Exhibit 6 and ask you to
5 explain what this is.

6 A. This is data from the EPA database that's called STORET,
7 data largely sampled by the State of Oklahoma, various
8 agencies, and what this shows is bars at the locations, at all
9 the locations in the state of Oklahoma where we had a minimum
10 of five samples with which to calculate a geomean. The dots at
11 the bottom of each bar indicates where that sample was actually
12 collected and then the height of each bar is proportional to
13 the concentration of the fecal indicator bacteria. So in this
14 case this would be for Enterococcus during the recreational
15 period May 1 to September 30. And the other thing that we did
16 is to color code them. The very small green bars that are very
17 short, those are the sites where the geomean concentration did
18 not exceed the standards for Enterococcus, which is 33 CFUs per
19 hundred milliliters. The orange bars are all the sites where
20 the concentration of the geomean concentration did exceed the
21 geomean standard. So what we see is again compared to the
22 Illinois River Watershed, we don't see really anything
23 different throughout the rest of the state in terms of the
24 prevalence of relatively high concentrations above standards
25 and, in fact, there are certain areas, especially in the urban

1 areas around Oklahoma City where the concentrations are
2 significantly higher. So, again, we don't see any apparent
3 geographical correlation between the poultry distribution I
4 just showed or between what we've got in terms of data from
5 this database of the Illinois River Watershed compared to the
6 rest of the state. The important thing here, I think, is that
7 the concentrations that we see in the IRW are not really any
8 different from what we see elsewhere in Oklahoma.

9 Q. Dr. Sullivan, did you limit your analysis to Enterococcus
10 or did you review other fecal indicator bacteria?

11 A. No, I looked at the other two indicator bacteria as well.

12 Q. Let me refer you to Demonstrative Exhibit 7 and ask you if
13 this is another map that you have prepared based upon the same
14 analysis?

15 A. Yes, the same analysis, the same dataset. This will be
16 fecal coliform bacteria rather than Enterococcus. Again, the
17 green bars are those that did not exceed the standard, and we
18 see fortunately much fewer exceedances and, again, there's
19 nothing the least bit unusual about the Illinois River
20 Watershed as compared with geographically across the state in
21 terms of the actual concentrations. So these would be -- would
22 be the geomean concentrations of five or more samples at each
23 site.

24 Q. Dr. Sullivan, did you also review the publicly available
25 data on E. Coli concentrations?

1 A. Yes, I did.

2 Q. Let me refer you to the last exhibit in the series,
3 Demonstrative Exhibit 8.

4 A. The same presentation. Again, we don't see a particular
5 difference in the Illinois River Watershed compared to the rest
6 of the state. I would point out that the five orange bars that
7 you see clustered around the Illinois River Watershed, actually
8 just one of those is inside the watershed. The other four are
9 just outside the watershed boundaries.

10 Q. You can retake your seat, Dr. Sullivan. I appreciate you
11 explaining that. Dr. Sullivan, based on the information that
12 you've reviewed and what you've just discussed with the Court,
13 do the locations of fecal indicator bacteria impairment in the
14 state correlate well with the areas of poultry production?

15 A. I don't see that that's the case, no.

16 Q. Based upon the information you've reviewed, are the areas
17 with the highest levels of fecal indicator bacteria impairments
18 in the state correlated well with areas of poultry production?

19 A. No, they're not.

20 Q. Now, Dr. Sullivan, have you evaluated the potential
21 sources of fecal indicator bacteria in the watershed besides
22 poultry litter?

23 A. Yes.

24 Q. And could you identify for the Court based upon the
25 information that you've reviewed the other significant

1 potential sources that you've identified?

2 A. Well, I think the most significant sources would be people
3 and cattle. We've talked a lot about cattle in this hearing so
4 far, not so much about people. In terms of sources from
5 people, there are many possible routes of fecal indicator
6 bacteria that are derived from human feces to make their way
7 into waterways, and then also derived from human activities
8 other than human feces. Key in that regard would be urban
9 runoff, which has been well-documented in terms of contributing
10 to fecal indicator bacteria in streams. As well as urban
11 runoff, we have septic systems that have been discussed.
12 There's a chronic input of bacteria from wastewater treatment
13 systems, and then there are periodic problems with those,
14 overflows and that sort of thing, sewage breaks. So there are
15 a number of potential sources of fecal indicator bacteria from
16 people that are important. Other sources besides the cattle
17 and the people would be things like wildlife and other
18 livestock.

19 Q. Okay. Dr. Sullivan, in addition to just thinking about
20 people globally, have you looked in this watershed at the areas
21 in which the human population is concentrated in urban areas?

22 A. Yes, I have.

23 Q. Let me refer you to Demonstrative Exhibit 13.

24 THE WITNESS: Your Honor, may I approach? Thank you.

25 Q. (By Mr. George) Dr. Sullivan, can you explain what is

1 Demonstrative Exhibit 13?

2 A. This is a map of land use from USGS data, Natural Land
3 Cover Dataset. I think this is really key to understanding
4 what is happening in this watershed, particularly with respect
5 to the areas of concentration of people. The areas in the
6 light blue color are the urban portions of the watershed. We
7 have a number of smaller urban areas distributed around the
8 watershed, but as we all know, the human populations are mostly
9 concentrated in the eastern part of the watershed. And this is
10 the upstream end of the watershed. And then we have the
11 agricultural areas that are in orange, and the green and other
12 are presumably more natural vegetation is in green. The
13 triangles here are the locations of the wastewater treatment
14 outflows.

15 Q. Dr. Sullivan, you've identified the urban areas as being
16 in what I would refer to as the headwaters of the watershed; do
17 you agree with that?

18 A. Correct.

19 Q. Is that significant scientifically?

20 A. It is significant. It's quite unique. The watersheds
21 that I've studied in the past, none of them have been like
22 this. And the reason it's unique is because in the headwater
23 areas we have what I consider to be some of our most important
24 sources of water pollution including fecal indicator bacteria.
25 Typically what you find, at least in the watersheds that I've

1 studied, is that in the upper portion of the watershed, you
2 tend to have more natural kinds of vegetation, perhaps forested
3 vegetation, that sort of thing, and that as you move down
4 through the watershed, then you have influence of things like
5 urban areas, agricultural activities and some of the things
6 that are associated with potential sources of pollution. So in
7 this situation, we have the opportunity for urban pollution
8 right from the git-go, right at the top of the watershed. That
9 makes it very difficult to evaluate what is happening as we
10 move down through the stream systems and we have other
11 potential sources of pollution added to the streams.

12 Q. Dr. Sullivan, can you explain to the Court the mechanisms
13 through which urban runoff can deliver fecal indicator bacteria
14 to the streams?

15 A. Yes. Urban runoff can deliver bacteria disproportionate
16 to its land area. This is a really important issue, and it has
17 been well-described in the scientific literature. It has to do
18 primarily with the fact that so much of the water that comes
19 down in rain is short-circuited through the urban environment,
20 through the storm drain systems and into the streams, and this
21 is a function of the large percentage of impervious area in
22 urban areas. These are areas where rainfall could not
23 percolate down into the soil. It's rooftops, it's sidewalks,
24 streets, parking lots, construction areas. All these areas
25 where the rain comes down, it can't go down into the soil, has

1 no way to go, nowhere to go, and people like to route it out of
2 the city as quickly as they can through the storm drain systems.
3 That's why they are there. The reason it's important is
4 because as water percolates down through the soil, it's a very
5 efficient filtering mechanism for many pollutants, including
6 fecal indicator bacteria, but with the short-circuiting you
7 have in urban environments there's little opportunity to that
8 to take place. And so you're picking up all the fecal material
9 from dogs, and cats, and wildlife, deer, whatever. Whatever is
10 in that environment short-circuited and moved directly into the
11 stream.

12 Q. Retake your seat, please. Dr. Sullivan, are there, in
13 fact, studies that exist in the scientific literature that
14 discuss the importance of urban runoff on fecal indicator
15 bacteria levels?

16 A. Yes, it's very well-described in the scientific
17 literature. In fact, there was an urban storm -- storm water
18 study by EPA in 1983 where they looked at this issue nationwide
19 and their conclusion was that typical concentrations in urban
20 areas were above 10,000 CFUs per hundred mil. They can be
21 quite high.

22 Q. Is the urban population in this watershed really large
23 enough to make it important as a contributor of fecal indicator
24 bacteria?

25 A. I believe that it is, yeah.

1 Q. Have you actually reviewed population data for the
2 watershed and cities that are located within it?

3 A. Yes.

4 Q. Let me refer you to Demonstrative Exhibit 15.

5 THE WITNESS: Your Honor, may I approach the picture?

6 THE COURT: You may.

7 Q. (By Mr. George) Dr. Sullivan, do you recognize
8 Demonstrative Exhibit 15?

9 A. Yes. First of all, let me state that the total human --
10 estimates of the total human population in the watershed is
11 around 300,000 people. So there are quite a few people in the
12 watershed. What I've attempted to do here is to look at the
13 changes over time and the population and these are the cities
14 on the Arkansas side of the watershed in looking at census data
15 from 1980, 1990 and 2000, and they have quite rapid growth in
16 population. As a matter of fact, northwest Arkansas in the
17 '90's was the sixth largest growing metropolitan area in the
18 United States. So the population growth has been quite
19 extreme. And that makes a big difference in terms of the
20 amount of construction that's going on, and that's certainly
21 something that I've observed in the watershed is that in that
22 easternmost upper end of the watershed there's a great deal of
23 construction, and that provides a lot of this impervious area
24 that I was talking about before.

25 Q. Dr. Sullivan, if you could retake your seat. Thank you.

1 Were you present for the Attorney General's opening statements
2 in connection with this motion?

3 A. Yes, I was.

4 Q. And did you see the chart that was presented during his
5 opening remarks which appeared to show that the poultry
6 production in this watershed had increased over time at a rate
7 more substantial than animals?

8 A. Yes, I did see that.

9 MS. BURCH: Your Honor, I object to this line of
10 questioning. This has not been disclosed in his affidavit or
11 any of his considered material.

12 MR. GEORGE: He's commented very directly on human
13 population in comparison to other populations in his affidavit
14 that's filed with the Court. I'm simply asking him to respond,
15 Your Honor, to something that was presented in court by the
16 Attorney General.

17 MS. BURCH: I guess it depends on where he goes with
18 it. Some of the demonstratives they've provided that go down
19 this road were not provided to us and not described in his
20 affidavit. Nothing in his considered materials support it.
21 So...

22 THE COURT: This has not been provided to you until
23 when?

24 MS. BURCH: I think we got a copy of the demonstrative
25 maybe March 5th, but there's none of the considered materials

1 or analysis that goes into -- I can give you the demonstrative
2 numbers if you like, but they basically go into analyzing
3 populations of humans and cattle and comparing it to phosphorus
4 levels in the lake, way outside anything that was in his
5 affidavit.

6 MR. GEORGE: Let me bring some clarity if I can, Your
7 Honor, unless Your Honor has a question, but the demonstrative
8 that we were about to move to is one that was compiled based
9 upon information provided by Dr. Fisher, and Dr. Sullivan
10 identified that as something that he had reviewed. He's
11 commented on the human population in his affidavit. I'm not
12 sure what you are referring to, Ms. Burch, in terms of
13 phosphorus levels. I don't intend to present through this
14 witness any comparison on human growth and phosphorus levels.

15 MS. BURCH: In one of your demonstratives, I think
16 it's Demonstrative No. 17. 17 and 18 both rely on Dr. Fisher's
17 information. Dr. Fisher's information that was relied on for
18 the preparation of these exhibits were not provided in Dr.
19 Sullivan's considered materials, nor was any of the analysis.

20 MR. GEORGE: Your Honor, may I respond briefly, and I
21 think we can bring this to a close? Did you say 15 and 17?

22 MS. BURCH: 17 and 18.

23 MR. GEORGE: I don't intend to offer Demonstrative
24 Exhibit 17. What is it? I didn't see it among the materials.

25 MS. BURCH: It was listed. So if you don't intend to

1 use it, it's less of a problem.

2 MR. GEORGE: What is it?

3 THE COURT: I don't see 17 in the packet.

4 MR. GEORGE: Right.

5 THE COURT: I may have overlooked it -- be overlooking
6 it, but it's not in the packet provided to me.

7 MR. GEORGE: I believe that's correct, Your Honor. I
8 don't recall at the moment what it was.

9 MS. BURCH: You don't intend to use it? You provided
10 this to us earlier.

11 MR. GEORGE: It was one that was never under
12 consideration for use, but we're not using it today.

13 MS. BURCH: Okay.

14 MR. GEORGE: So 17 is withdrawn, Your Honor. It was
15 never offered for that matter.

16 THE COURT: All right.

17 MR. GEORGE: With regard to Demonstrative Exhibit 18,
18 and it is information from notes as it the footer, that is
19 taken from the materials of Dr. Fisher. And there was an
20 agreement between counsel for both sides in this case that we
21 wouldn't reproduce each other's expert considered materials.
22 So this particular --

23 MS. BURCH: But there was an agreement -- I'm sorry.

24 MR. GEORGE: I'm sorry. This particular demonstrative
25 exhibit has been in the hands of Ms. Burch for some time.

1 THE COURT: Did this witness not compare human versus
2 animal?

3 MS. BURCH: This witness, no. This witness provided
4 some general information on the population, which is reflected
5 in the demonstrative or the exhibit that they just went over,
6 but analysis of populations in comparison to one another was
7 not conducted.

8 MR. GEORGE: Your Honor, I'm looking through the
9 affidavit. Certainly the witness commented on the human
10 population in the watershed. In fact, the demonstrative that
11 is on the screen is an exhibit to his report. So the witness
12 has clearly commented both in the filing with the Court and
13 here today on human population.

14 THE COURT: I understand.

15 MS. BURCH: If I may, I don't mean to imply that he
16 didn't talk about populations in the cities. I guess what has
17 not been disclosed before would be the analysis through time
18 that's reflected on this from 1950 to 2010 in relation to each
19 other. That was not addressed in the affidavit or the
20 considered materials before.

21 MR. GEORGE: Your Honor, one last point, if I may.

22 THE COURT: Yes, please.

23 MR. GEORGE: The demonstrative exhibit that is in
24 question is simply taking data provided by Mr. Fisher, with no
25 manipulation, and plotting it on a chart. So there's no

1 analysis here, it's just a way of comparing. There was a
2 graphic presented to the Court in opening statement that we
3 believe is somewhat misleading if it's not interpreted
4 properly. And so we simply wanted an opportunity to present to
5 this Court what we think is a more fair presentation of the
6 data.

7 THE COURT: All right. And because I am operating in
8 a vacuum here, this was not provided until recently; is that
9 correct?

10 MR. GEORGE: No, Your Honor. This exhibit has been
11 one that was disclosed from -- consistent with the Court's
12 scheduling order on disclosing exhibits in this case for
13 several weeks.

14 MS. BURCH: Your Honor, I received it on March 5th, I
15 believe, and I'm not, I guess, concerned about the fact that I
16 didn't receive the demonstrative in time. It's just difficult
17 to be able to cross-examine a witness on something if you
18 weren't provided any of the underlying analysis and materials.
19 I disagree completely that preparation of a graph like this
20 doesn't require any analysis of data. It clearly does. I
21 wouldn't be able to do it.

22 THE COURT: Now, March 5th, is that not outside the
23 Court's schedule for providing materials?

24 MS. BURCH: I think it's definitely outside of the
25 Court's time for providing the expert considered materials and

1 exhibits. There was an exception for demonstratives to be
2 provided a certain amount of time before testimony, so in that
3 way it's not, but it is definitely contrary to the Court's
4 order with regard to providing the underlying considered
5 materials.

6 MR. GEORGE: Your Honor, I apologize. Ms.
7 Southerfield is present in the courtroom. She was responsible
8 for delivering demonstratives in keeping with this Court's
9 72-hour requirement before a witness takes the stand. I'm sure
10 she can verify that this exhibit was delivered timely.

11 MS. SOUTHERLAND: What was the number, please?

12 MR. GEORGE: It is Demonstrative Exhibit 18.

13 MS. SOUTHERLAND: According to me, we exchanged
14 Demonstrative 218 on February the 16th, 2008.

15 MS. BURCH: Okay. So I guess I'm in error. The first
16 time I saw it was on March 5th. There's been a lot of things
17 exchanged, and I apologize for that. I don't think I'm in
18 error, and I don't think they disagree with me that none of the
19 analysis of the data or the actual exhibit was provided as
20 something that the expert created.

21 THE COURT: All right. It appears to me that the
22 plaintiff has not had an opportunity to verify, if I understand
23 correctly, that these -- that this demonstrative reflects Dr.
24 Fisher's data; is that correct?

25 MS. BURCH: Yes.

1 THE COURT: The objection is sustained with respect to
2 this particular demonstrative. Anything else?

3 MS. BURCH: No.

4 MR. GEORGE: Thank you, Your Honor.

5 Q. (By Mr. George) Dr. Sullivan, do you agree with the
6 statement that the poultry population in the watershed has
7 increased over time at a rate more substantial than the human
8 or the cattle population?

9 A. No, I don't. When I look at the data regarding the
10 increase in population of --

11 MS. BURCH: I'm sorry. Objection, Your Honor. This
12 is testimony about the subject matter that was covered on the
13 previous exhibit. This is the precise type of testimony I was
14 objecting to.

15 THE COURT: At least with respect to human. Now he's
16 comparing human versus poultry. Do I need to see his initial
17 affidavit because frankly, I took it with all the other
18 materials at lunch with me, so I don't have it here in the
19 courtroom.

20 MR. GEORGE: I do have a copy of the affidavit, Your
21 Honor.

22 THE COURT: Let me take a look since this is an issue.
23 The objection is sustained.

24 MR. GEORGE: Thank you, Your Honor.

25 Q. (By Mr. George) Refer back to Demonstrative Exhibit 13,

1 Dr. Sullivan. You mentioned the triangles on this map. Could
2 you remind us what they refer to?

3 A. Yes. These are the wastewater treatment plants that
4 discharge directly into the stream system.

5 Q. Dr. Sullivan, in addition to the daily discharges, has
6 your work in this case documented any periodic discharges of
7 untreated wastewater?

8 A. Yes.

9 Q. And let me refer you to Demonstrative Exhibit 16, which is
10 a copy of a chart that's included in your expert report.

11 THE WITNESS: Your Honor, may I approach?

12 THE COURT: You may, sir.

13 Q. (By Mr. George) Dr. Sullivan, could you please explain
14 Demonstrative Exhibit 16?

15 A. Yes. This is a summary of data that were available on
16 sewage bypasses from some of the communities inside the
17 Illinois River Watershed, and the point is that there were
18 periodic discharges or bypasses with rather large volumes of
19 raw sewage. This would not be sewage that had been treated.
20 This is not like a bypass when it rains too much. This is a
21 bypass -- it can be a bypass when it rains too much and there's
22 raw sewage that's actually released directly into the river
23 system or some other kind of a sewage line break that has the
24 potential to impact the stream system. But we have median
25 concentrations from the different communities that can be as

1 low as 200 gallons to as high as 7,000 gallons depending on
2 which community we look at, and with median concentrations of
3 fecal coliform bacteria that range between about ten to the
4 twelfth and ten to the fourteenth. So ten to the ninth is a
5 billion, ten to the twelfth is a trillion, so these are
6 trillions of bacteria per bypass. This is an infrequent source
7 but can be a significant source of fecal indicator bacteria to
8 the stream system.

9 Q. Dr. Sullivan, you mentioned a -- perhaps a break in a
10 sewer line as an explanation. What were some of the other
11 causes well known to result in a bypass of a treatment process
12 and direct discharge?

13 A. It would be the treatment system receiving more water
14 because of high rainfall, more water than it can handle, and
15 therefore, they can be forced to discharge some of the
16 wastewater. And this is an occasion that happens during storm
17 conditions.

18 Q. Dr. Sullivan, let me refer you back to Demonstrative
19 Exhibit 13, which is your watershed map. Are there any
20 municipal sewage systems that operate in the basin that are not
21 shown in your map?

22 A. Yes, there are. There are municipal sewer systems that
23 don't discharge directly through a pipe into the stream system.
24 They would have like a lagoon system, for example, to deal with
25 the sewage material. There's one that I'm aware of that's in

1 the vicinity of Watts.

2 Q. The one you're aware of in the vicinity of Watts, is it
3 located near the Illinois River?

4 A. Yes, it is.

5 Q. Approximately how close are the lagoons at Watts?

6 A. They're about 500 yards away from one of the USGS sampling
7 site locations, what's called the Watts site.

8 Q. The USGS sampling location at Watts, have you reviewed the
9 data from that location?

10 A. Yes. They have periodically collected water samples and
11 analyzed them for fecal indicator bacteria, and I've looked at
12 those data.

13 Q. Have you noted in the data from the USGS station at Watts
14 anything interesting or peculiar in terms of bacteria
15 concentrations?

16 A. Yes. USGS has collected samples from a number of sites
17 around the watershed, and the location at Watts is somewhat
18 different for two reasons. First of all, it tends to be
19 higher, often quite a bit higher than any of the other
20 locations; and secondly, it tends to jump up quite a bit as
21 compared with the site immediately upstream of Watts, and
22 that's at the Arkansas Highway 59 bridge crossing, and that
23 site is only about four miles away. So in a rather small space
24 of river reach, we tend to see oftentimes quite significant
25 increases in bacteria and, again, achieving what are normally

1 the higher levels of bacteria in the system as measured by
2 USGS.

3 Q. Let me refer you to Demonstrative Exhibit 78. Can you
4 describe for the Court what's shown in Demonstrative Exhibit
5 78?

6 A. Yes.

7 THE WITNESS: Your Honor, may I approach the screen?

8 MS. BURCH: Your Honor, I object to the use of this
9 photo as well. This wasn't in the considered materials.

10 MR. GEORGE: Your Honor, it's a demonstrative exhibit
11 simply designed to illustrate -- actually not illustrate,
12 depict the conditions the witness has just described.

13 THE COURT: And as a demonstrative we're not admitting
14 it into evidence?

15 MR. GEORGE: That's correct, Your Honor.

16 THE COURT: Overruled.

17 THE WITNESS: May I approach the screen?

18 THE COURT: You may.

19 A. This is the location of the lagoons for the City of Watts
20 and the application area for the excess water. This is the
21 main stem Illinois River, and this is the bridge crossing,
22 Oklahoma Highway 59 where USGS collects their samples. So the
23 distance from the lagoons to the sampling site location is
24 about 500 yards.

25 Q. (By Mr. George) Dr. Sullivan, are you aware of any

1 concerns being voiced by federal agencies about bacterial
2 contamination of the river from these lagoons?

3 A. Yes. U.S. Fish and Wildlife Service voiced concerns in
4 conjunction with a request to increase the capacity by taking
5 sewage from West Siloam Springs and adding it to the Watts
6 system, and the concern voiced by USGS was with respect to the
7 possibility of polluting the Illinois River.

8 Q. Okay. Retake your seat, please. Now, Dr. Sullivan, for
9 all of the sources that you've identified and discussed with
10 the Court for fecal indicator bacteria, do you have an opinion
11 as to when these sources are most likely to influence bacterial
12 levels in the streams and rivers?

13 A. Yes. That would be at high flow.

14 Q. Have you actually looked at water quality conditions that
15 exist during periods of low or moderate flow as well?

16 A. Yes, I have.

17 Q. Okay. And why have you done that?

18 A. Well, I think it's important to distinguish between high
19 and low flow because as I understand it, a major point of this
20 preliminary injunction is the possibility of exposure of
21 recreationists, especially with primary body contact
22 recreation, which is actually swimming and being in the water
23 with the possibility of ingestion, and in my opinion, that
24 would be most likely to occur during low and moderate flows.
25 So I think it's important to separate out the concentrations

1 that are achieved at high flow versus what's achieved at the
2 lower flow conditions.

3 Q. Dr. Sullivan, have you, based upon your review of the data
4 collected during high flow, low flow and moderate flow
5 conditions, reached any conclusion as to the general condition
6 of the water during the time that you've described as most
7 likely to be used for primary body contact recreation?

8 A. The general contact -- the general condition of the water
9 during the lower and moderate flows is generally not above the
10 standards for fecal coliform bacteria or E. Coli.

11 Q. Dr. Sullivan, have you also looked at not only the times
12 of use but the areas in which water in the watershed is most
13 commonly used and evaluated data based on those areas compared
14 to areas where it is not used as regularly?

15 A. Yes, I have.

16 Q. Okay. Let me refer you to Demonstrative Exhibit 19, which
17 is a map.

18 THE WITNESS: Your Honor, may I approach the exhibit?

19 THE COURT: You may, sir.

20 Q. (By Mr. George) Dr. Sullivan, could you explain what is
21 shown on Demonstrative Exhibit 19?

22 A. Yes. This is a depiction of the stream system in the
23 Illinois River. The area that was identified by Dr. Caneday as
24 the main recreation area is coded here in orange, so you can
25 see where that is. And these are color coded by what's called

1 Strahler Stream Order, and this -- I may need to have just a
2 little bit of time to explain what this means so that this
3 demonstrative can make sense. Strahler Stream Order is a way
4 of classifying stream reaches based on their size or relative
5 size and their position in the watershed. So if you start up
6 in the headwaters with a small stream, that will be called a
7 first order stream, a stream with no tributaries feeding into
8 it. That's a first order stream. As it flows downhill and
9 combines with another first order stream, then that becomes a
10 second order stream. As that continues down the hill, if more
11 first order streams flow into it, it's still second order, it
12 doesn't change, but once two second order streams come
13 together, that becomes a third order stream and so on. And so
14 what I've done is I've not shown the first order streams on
15 here. I've shown the second order through seventh order.
16 Where Barren Fork joins with the main stem Illinois River down
17 here right at the bottom of the watershed it becomes seventh
18 order there. So Basically we're looking at a distribution
19 going from second order down through sixth order, and this is a
20 way of classifying the stream so we can look at conditions like
21 chemistry or bacteria concentrations in the smaller streams
22 versus the larger streams, which is important in this case
23 because it's the larger streams where my understanding that
24 most of the recreation occurs that would be likely to have
25 primary body contact.

1 Q. Dr. Sullivan, what are the stream orders that, based on
2 the information you've been provided are the ones that receive
3 the most substantial use in terms of recreation; what order?

4 A. The sixth order. The main stem Illinois River through
5 here, the sixth order.

6 Q. There's been some testimony in this court about use of the
7 Flint Creek area for recreation, including water recreation.
8 What stream order is that area?

9 A. That would be fourth in its upper reaches and fifth in its
10 lower reaches. So these areas that are identified as key
11 recreation areas would be fourth, fifth and sixth order.

12 Q. Dr. Sullivan, when you reviewed the data collected by the
13 State from its sampling in this case, with regard to the
14 fourth, fifth and sixth stream orders, do you have an opinion
15 as to whether the water quality conditions generally are
16 satisfactory in terms of water quality standards in those
17 areas.

18 A. Yes, with respect to fecal coliforms and E. Coli, they're
19 generally satisfactory.

20 Q. Where are the areas in which the State's sampling has
21 identified the higher levels of fecal coliform or fecal
22 indicator bacteria?

23 A. That would be primarily in the smaller streams.

24 Q. Now, Dr. Sullivan, as part of your review in this case,
25 did you consult and analyze information regarding the protocols

1 put in place for the State as part of its sampling program?

2 A. Yes, I did.

3 Q. And did you review information provided by any other
4 expert relative to breaches of those protocols?

5 A. Yes. I reviewed information from Conestoga-Rovers &
6 Associates, the report that was provided by them. I talked to
7 Mr. Churchill about those breaches. I reviewed a video.

8 Q. What video did you review, Dr. Sullivan?

9 A. It was a video of a sampling events at a spring location.

10 MS. BURCH: Your Honor, I object -- I'm sorry to
11 interrupt you, sir. I object to this testimony as well. There
12 was no video provided to us in his considered materials.

13 MR. GEORGE: Your Honor, the video is already in
14 evidence subject to the stipulation. The video was produced as
15 part of Mr. Churchill's considered materials in this case, and
16 Dr. Sullivan in his affidavit acknowledges in a very separate
17 place the fact that he has reviewed the information provided by
18 Dr. Churchill.

19 MS. BURCH: I guess the fact that it's been discussed
20 by another witness in the case doesn't really answer my
21 concern. My concern is there was no indication in his
22 considered materials that he had looked at a video, and that
23 material wasn't identified in his, so therefore, I wouldn't
24 have known to have reviewed it.

25 THE COURT: Well, in this previous discussion it begs

1 the question, of course, because typically in a battle of
2 experts, experts can remain in the courtroom and view the
3 testimony of other experts and comment upon opinions of other
4 experts and take into consideration testimony that has been
5 elicited during the course of the trial. Speak to me why that
6 generally ought not apply here. See, one of the problems here,
7 of course, is that given that this is a preliminary proceeding
8 as opposed to a proceeding that has occurred or is occurring
9 after the close of discovery, we tried to fashion, back in
10 November, some ground rules. Because the plaintiff wished to
11 have an expedited proceeding, the Court permitted certain
12 discovery relative to the plaintiffs' experts who had been
13 gathered quite some time ago, and the plaintiff had had the
14 benefit of discovery in the case-in-chief, which is somewhat
15 different than typical preliminary injunction proceedings,
16 which normally occur at the outset of a case.

17 So given that general overview, why should this
18 witness not be able to opine to the extent that he has been
19 here apparently through the entire proceeding. Is that right,
20 Dr. Sullivan?

21 THE WITNESS: Almost, sir.

22 THE COURT: To opine relative to opinions and
23 testimony that has been presented to this Court?

24 MS. BURCH: I guess the main thing would be the fact
25 that there hasn't been a video shown in the courtroom, and I

1 don't think to my memory Mr. Churchill played a video and
2 discussed a video related to spring sampling. So, I mean, I
3 don't really understand.

4 THE COURT: I don't recall a video. We're not talking
5 about a video that's been presented to the Court; correct?

6 MR. GEORGE: Well, there is a video that's into
7 evidence pursuant to the stipulation. I don't believe the
8 spring sampling video was shown during Mr. Crutcher's
9 testimony, I think that's accurate -- Churchill. Sorry. I
10 would say, Your Honor, that this exact incident that I'm asking
11 this witness to comment on is discussed at length in his
12 affidavit beginning on Page 8, Paragraph 22 and continuing
13 through 24, and it references, you know a person standing in a
14 body of water while sampling, and it's clearly a video that the
15 plaintiffs have been provided and that this witness --

16 THE COURT: Oh, this is the picture that I saw of
17 the --

18 MR. GEORGE: It is a picture, but there's actually a
19 very short -- I don't mean to interrupt, Your Honor.

20 THE COURT: I'm just trying to recall. It's the small
21 pool?

22 MR. GEORGE: It is, Your Honor.

23 THE COURT: All right.

24 MR. GEORGE: It is. There's about a 30-second video
25 that is important to this witness' analysis of some of the

1 problems associated with the water quality data that I would
2 like to play and let this witness briefly explain. Exhibit 48.

3 THE COURT: Any objection?

4 MS. BURCH: Well, I mean, I do think that they had an
5 obligation to disclose things that he was going to be
6 testifying about as considered materials but if --

7 THE COURT: Well, apparently he makes reference in his
8 affidavit; correct?

9 MR. GEORGE: Yes. And your Honor, I apologize. I
10 don't mean to sound argumentative with Ms. Burch, but this
11 video is on the list of exhibits that we intended to use with
12 this witness that was provided in compliance with this Court's
13 order.

14 THE COURT: Overruled. Go ahead.

15 Q. (By Mr. George) Okay. Dr. Sullivan, after that, could
16 you please explain to the Court the video that is being shown
17 and why it is important to your opinion regarding the quality
18 of the State's sampling?

19 A. Yes. I think it goes by very quickly, so I think it's
20 important if I -- can we not show it yet?

21 Q. It will be up in just a moment.

22 A. Okay. This is where the sampler is going to be stepping
23 into the stream. This shows the width of the stream here, and
24 there's a couple of points, and I don't have time to make them,
25 I'll make them later. But the sampling should be occurring out

1 in the middle portion of the flowing water, not along the edge
2 where it can be impacted by what is happening along the edge.
3 A sampler should never step into a stream and then sample in
4 such a way to collect water that receives disturbed sediment.
5 And if you can see, he's collecting right along the edge of the
6 stream and right below and next to where he stepped. And if
7 you look carefully, you'll see some of the sediment billowing
8 up from the place where he disturbed it and moving directly
9 where he sampled. It's hard to see. It's right here. The
10 sediment is heading from where he disturbed directly towards
11 the tube that is pulling in water into his sample. This is way
12 beyond a procedural breach. This is inexcusable sampling
13 procedure in a number of ways. The first way is the importance
14 of when you collect the sample, that sample has to be
15 representative of something. If it's a sample of a stream,
16 it's got to be collected out in the middle of the stream, not
17 where influence from the side can give you different chemistry
18 or different biology. It's got to be in the middle, not along
19 the surface where again you can get different chemistry
20 biology. It needs to be in the middle area of flow. The same
21 thing with this situation, it was a spring sampling that was
22 actually collected downhill from where the spring exited the
23 ground. This is another important point. A number of the
24 State witnesses, in particular Dr. Teaf and Dr. Fisher, have
25 classified the spring data as representations of groundwater.

1 Well, if it's going to be representations of groundwater,
2 again, the a sample has to represent what it's intended to
3 represent. That's got to be water where it comes out of the
4 ground, not after it's had a chance to have impact from fecal
5 material on the surface, from cattle or from whatever.

6 Then the second problem is that again you need to
7 sample out in the middle and away from the influences of the
8 side. That wasn't done.

9 And the third and most egregious problem is you never,
10 ever step in a stream or any body of water and sample in a
11 location where you can get contamination from the disturbance
12 that you made. This is -- this illustrates very clearly to me
13 that the people involved in that particular sampling instance
14 didn't have the proper training and did not have the proper
15 oversight. Now I have no videos and have no personal
16 observation of what happened when the stream sampling was
17 occurring or the other spring sampling was occurring, but if
18 this is reflective of the training and the oversight that was
19 provided to me, I really don't have confidence in those data.

20 Q. Dr. Sullivan, in addition to the breaches of the sampling
21 protocols that were shown in the video and that you discuss in
22 your affidavit that we pointed the Court to, do you have any
23 other concerns regarding the quality of the data in terms of
24 quality control?

25 A. Yes, I do, and I think that it's called QA/QC, quality

1 assurance, quality control. In a sampling program for waters
2 like this, you need to have a QAC program in place. It's
3 standard procedure, everybody does that. And there are typical
4 --

5 MS. BURCH: Your Honor, again, there is absolutely no
6 discussion of QA/QC protocols in here in the affidavit.

7 MR. GEORGE: Your Honor, first of all, the objection
8 would have been timely when the question was made, not in the
9 middle of the witness' answer. But secondly, this witness has
10 commented in his declaration on the lack of representativeness
11 and reliability of the State's sampling data, as has been the
12 case with every expert witness that has been presented. The
13 affidavits are by definition condensed versions of what would
14 be the subject of testimony. I believe it's fair play.

15 THE COURT: Overruled.

16 A. In terms of QA/QC programs, typically you would target a
17 minimum of 10 percent of your samples would be QA/QC samples.
18 The USGS targets between 10 and 20 percent. USGS in water
19 sampling is, I view them as the gold standard of the way water
20 sampling should be done. So 10 to 20 percent is what USGS
21 recommends. There are a number of different types of QA/QC
22 samples. The most important ones would be sample replicates
23 and field blanks. Now what a field blank is, is you take the
24 ionized distilled water that would not have bacteria or other
25 contaminants in it into the field with you, and you process it

1 through your sampling equipment and everything just like a
2 sample out of a stream or out a spring, and then you take that
3 sample back to the laboratory and have them analyze it and
4 presumably you will get zero bacteria or whether the
5 constituent is that you are looking for. And that's a way to
6 test for contamination problems by the field people and the lab
7 people all mixed together, that's a reflection of what kind of
8 contamination you might have in your overall system. And to
9 demonstrate good quality data, you want to see a bunch of zeros
10 for your field blanks.

11 The other very important QA/QC sample type is this
12 replicate, a field replicate. And what that means is, and you
13 can call -- there are different types of field replicates, the
14 most important one is sequential field replicate where you
15 collect a sample in the field, and then you immediately, within
16 a few seconds or a minute, as quickly as you reasonably can,
17 you collect another one, and then again you process those all
18 the way through the laboratory just like any other sample. And
19 so you have two samples that are intended to represent the same
20 thing. They are intended to represent the chemistry or biology
21 of that water at that place at that time. It incorporates the
22 uncertainty in your ability to sample at exactly the same spot.
23 Again, in the stream you sample in the middle, you sample in
24 the middle of the depth, and you are looking for the measure of
25 central tendency of that water, the bulk of that water, that's

1 what you want. And you can never sample exactly the same spot,
2 so you want to know how much uncertainty you have in doing
3 that. You also want to know how much uncertainty you have in
4 collecting a sample, and then 15 or 20 or 30 seconds later
5 collecting another one because that variability we know occurs,
6 and you want to know how that influences the final number you
7 end up with. And then rolled into the analysis of those two
8 duplicates, those two replicates would be also any errors
9 associated with the field sampling work, any errors associated
10 with the lab. So it's all rolled together into one pair of
11 numbers, and you want them to come out fairly closely. And
12 again, what the USGS recommends is about 5 to 10 percent of
13 these field replicates and about 5 to 10 percent of the field
14 blanks. And there are other kind of QA/QC samples you can
15 include, but those are the main ones.

16 When I looked at the database from the State, first of
17 all, it was very difficult to decide where there were QA/QC
18 samples. So this is my impression of what I've seen, is I saw
19 five of what looked to me to be clearly field replicates. The
20 agreement was not encouraging to me. There were two pairs that
21 differed by 500 to 700 percent. There was one pair where the
22 E. Coli concentrations were 200 and 1,400 CFUs per hundred mil.
23 There was another pair that differed by about a factor of five.
24 It was approximately 50 and 250. It was 46 and 240, something
25 like that, but about a factor of five. So because there were

1 only five replicates as far as I could determine collected, and
2 two of them looked pretty bad, again, I don't have a lot of
3 confidence in this data.

4 MS. BURCH: I think there's a big difference between
5 testifying about QA/QC for sampling protocol in the field and
6 stepping in a spring or not stepping in a spring, as opposed to
7 now he's giving testimony about reviewing data in a database
8 and whether one particular sample, you know, was different than
9 another field QA/QC sample. I don't have any of that
10 testimony. I don't have any considered materials on that. I
11 don't have anything in his affidavit on that. It's the first
12 time I'm hearing it.

13 MR. GEORGE: Your Honor, two points. First of all,
14 the testimony is concluded, and we're ready to move to the next
15 subject but, secondly, the data that he is describing, the data
16 he's describing is data produced by the State, the State's own
17 data. There have been witnesses presented in this courtroom at
18 length discussing this data. It's been fairly disclosed and in
19 the hands of all parties.

20 THE COURT: Well, perhaps I misunderstand, but the
21 replicate sampling is part of QA/QC, correct or am I --

22 THE WITNESS: It's supposed to be.

23 THE COURT: All right. So it appears that with
24 respect of the most recent testimony here, that's encompassed
25 within the earlier objection. I don't have the affidavit in

1 front of me. I'm relying on Mr. George's statement relative to
2 quality control, that a statement was made critiquing the
3 State's quality control. Correct, in the affidavit?

4 MR. GEORGE: Your Honor, I don't know if you'll find
5 the term quality control, but --

6 THE COURT: All right. Let me see it because this is
7 now the third objection in this regard.

8 MR. GEORGE: Let me say this, Your Honor, while I'm
9 passing it out. The comment that is the foundation for this in
10 the affidavit is his comments about the reliability of the
11 data.

12 THE COURT: What paragraph?

13 MR. GEORGE: Your Honor, I handed you my only copy. I
14 apologize.

15 THE COURT: I apologize as well, but I don't have
16 mine.

17 MR. GEORGE: Could you identify it, Dr. Sullivan, if I
18 handed it to you?

19 THE COURT: Let me allow you to take a look. I'm
20 going to retrieve my books. It's there's three big books, Mr.
21 Overton. And we'll cool our heels until those are brought
22 back. Mr. George, if you could look, while Mr. Overton is
23 getting my books, and tell me what paragraph of Dr. Sullivan's
24 affidavit we're referring to?

25 MR. GEORGE: Thank you, Your Honor. I'll do that.

1 Your Honor, the paragraphs where problems with the data are
2 being discussed is Paragraphs 22, 23, 24 and 25.

3 THE COURT: All right. Having read the Paragraphs 22,
4 23, 24 and 25, the objection regarding standing in the body of
5 water while sampling is overruled in that the topic is raised
6 at length here. However, with respect to replicate sampling, I
7 don't see anything in here in terms of a criticism as a result
8 of not taking replicate sampling. I may be overlooking
9 something here ruling on the fly, but based upon my review of
10 those paragraphs, the objection is sustained in that regard.

11 MR. GEORGE: Thank you, Your Honor.

12 Q. (By Mr. George) Dr. Sullivan, I'll refer you to the last
13 exhibit, defendants' Exhibit 14. It's the one I actually
14 skipped in the series. Dr. Sullivan, were you asked to
15 identify the areas in the watershed which have the heavier
16 concentration of cattle population?

17 A. Yes, I was.

18 Q. And have you done that?

19 A. Yes.

20 Q. And could you please explain what is Demonstrative Exhibit
21 14?

22 THE WITNESS: Your Honor, may I approach the screen?

23 THE COURT: You may, sir.

24 A. This is a map depicting the densities of cattle, animals
25 per square mile. The darker colors indicate the higher

1 densities. The lighter colors indicate the lower densities and
2 these were organized by Zip Code. That was the highest level
3 of resolution we could come up with to do that. And basically
4 what this shows is that the cattle are distributed throughout
5 the watershed, but the higher densities tend to be, again, in
6 the headwater areas. And this is particularly problematic, and
7 it's something that we touched on with respect to the human
8 populations, is in the headwater areas of this watershed,
9 that's where we have most of the people, that's where we have
10 most of the land disturbing construction activities, most of
11 the urban runoff, and it's also where we have a rather
12 significant number of cows in the areas surrounding those
13 communities. And this is problematic because these are the two
14 sources that I would consider to be the most likely to be
15 important in terms of contributing fecal indicator bacteria to
16 the stream systems, is where the cattle are and where the
17 people in urban areas are concentrated, and in both cases
18 they're at the upper end which makes it, I think, quite
19 difficult to interpret what's happening as we are move down
20 through the watershed, and we have other potential sources
21 kicking in, is to figure out what's really causing any
22 particular problems that one may observe.

23 MR. GEORGE: I'll pass the witness, Your Honor.

24 THE COURT: Cross-Examination.

25 CROSS-EXAMINATION

1 BY MS. BURCH:

2 Q. Kelly Burch for the State of Oklahoma. Could you describe
3 to me in a little bit more detail what a PhD in biological
4 sciences is?

5 A. It's a PhD that focuses on biology that -- the program
6 that I was involved in was a rather unusual interdisciplinary
7 PhD program, which could be customized depending on the
8 interest of the student, and mine was customized to focus on
9 environmental chemistry, ecology and zoology.

10 Q. And is the science of microbiology encompassed within
11 those three topics that you just listed?

12 A. Microbiology would not be considered as one of those three
13 areas of specialization. It would be included within the
14 general area of biological sciences.

15 Q. Okay. That's not something that you focused on, though,
16 when you were getting your PhD?

17 A. I focused more on microbiology when I was involved in my
18 master's program than my PhD, and I focused more on
19 microbiology in some of my research that I've conducted since
20 my PhD.

21 Q. Okay, and when you're talking about the research, would I
22 be correct if I said that most of that research that you've
23 done with regard to microbiology has been in -- I'm not sure
24 I'm going to say it correctly -- Tillamook Bay?

25 A. In the Tillamook area. I've also interpreted the results

1 of microbiological data in conjunction with probably about ten
2 watershed assessments, and these were the assessments where
3 we're looking at what's going on throughout the watershed, much
4 as we are here in the Illinois River Watershed and looking at
5 the impacts of human activities, of forestry, road building,
6 erosion, we're looking at urban influences with respect to
7 constituents like nutrients, bacteria, suspended solids, pH, I
8 mean, a lot of the same kinds of things that we're evaluating
9 here. And in the context of those watershed assessments, we
10 routinely look at fecal indicator bacteria concentrations, and
11 that's a microbiological topic area.

12 Q. Okay. And you also looked at -- or have you had education
13 in hydrology?

14 A. I haven't had any courses in hydrology. I've done a
15 number of studies that include hydrological elements; worked
16 with watershed mathematical models that include hydrological
17 components; published papers in the Journal of Hydrology. So I
18 don't consider myself a hydrologist, but I have a lot of
19 experience in hydrological research areas.

20 Q. You've been involved in several watershed assessments you
21 said; correct?

22 A. Yes. I think I've been involved in at least ten myself.
23 My company has done 15 or 16 in the last maybe eight or ten
24 years.

25 Q. And were most of those in Oregon?

1 A. Yes.

2 Q. Were they -- how many of those were associated with the
3 Tillamook Bay?

4 A. Two.

5 Q. Two of those?

6 A. Yes.

7 Q. When you work on a watershed assessment, do you do any
8 sampling yourself?

9 A. Typically not. The watershed assessments that I did in
10 the Tillamook area, I think one of the reasons that we were
11 selected to do those assessments is because I had done quite a
12 lot of sampling in those rivers in that basin, but typically
13 the watershed assessment process does not involve collecting
14 new data, it involves interpretation of existing data, much as
15 I'm trying to do in this case.

16 Q. Have you -- and when you have worked on these watershed
17 assessments, have you relied on data collected by state
18 agencies?

19 A. Yes.

20 Q. What about USGS?

21 A. Yes.

22 Q. And do you consider USGS data to be fairly reliable?

23 A. I think that USGS data in general is very reliable.

24 Q. I think in your affidavit you said that it was extremely
25 reliable, something like that?

1 A. I wouldn't disagree with that.

2 Q. They produce high quality data that you can depend on when
3 you're making decisions about what's happening in the
4 environment?

5 A. I think that's generally correct.

6 Q. Okay. Are fecal indicator bacteria an issue in the
7 Tillamook Bay?

8 A. Yes, it's a big issue.

9 Q. Okay. I'm going to hand you what I have marked here as
10 574. If I can approach?

11 THE COURT: You may.

12 Q. (By Ms. Burch) Do you recognize that document?

13 A. No, but I see elements that might make sense that this
14 would be from the TEP.

15 Q. What is the TEP?

16 A. Tillamook Estuaries Partnership.

17 Q. Have you done any work with them?

18 A. Yes, I have.

19 Q. Have you seen their web page before?

20 A. I believe I have things on their web page. I haven't
21 perused it ever, I don't think.

22 Q. Does that appear like the TEP Web site?

23 A. Well, like I say, I've never perused it. So I'm really
24 not sure.

25 Q. Okay. Let me refer you to the first paragraph that talks

1 about the TEP bacterial monitoring program. Are you familiar
2 with the monitoring program that TEP is involved in?

3 A. Yes, I wrote the quality assurance document for that
4 monitoring program.

5 Q. Okay. Would you look down about the third sentence that
6 starts with the word "bacteria" and read that sentence into
7 the --

8 A. I'm sorry. Where are we?

9 Q. In the very first paragraph.

10 A. Very first paragraph.

11 Q. Do you see the third sentence that starts with the word
12 "bacteria"?

13 A. Yes. "Bacteria contamination is a significant threat to
14 public health and aquatic function and originates from point
15 and non-point sources and runoff from agricultural, urban and
16 residential land uses along the rivers."

17 Q. In the Tillamook Bay watershed, is land application of
18 manure from dairy operations a significant source of fecal
19 indicator bacteria?

20 A. It has been in the past. It's something that the TEP and
21 others have been working on quite a lot in the recent years to
22 try to minimize.

23 Q. Are you aware of any studies that have been done using PCR
24 techniques to be able to do source identification?

25 MR. GEORGE: Your Honor, outside the scope of direct.

1 We didn't call this witness on PCR.

2 THE COURT: Sustained.

3 Q. (By Ms. Burch) Okay. What techniques were used in this
4 watershed to identify sources of bacteria pollution?

5 MR. GEORGE: Your Honor, same objection. I believe
6 that Ms. Burch is seeking to turn Dr. Sullivan into perhaps a
7 bacterial genetic marker witness, which would be outside his
8 scope.

9 MS. BURCH: I'm seeking to evaluate his knowledge of
10 watershed assessments. He's testifying about sources in this
11 watershed, and I think I should be able to inquire into how he
12 has looked at sources or worked with other people to look at
13 sources in other watersheds.

14 THE COURT: I'll give you some leeway, but we're not
15 going to go full tilt here.

16 MS. BURCH: I understand.

17 THE COURT: Overruled.

18 THE WITNESS: I'm sorry. Can you restate the
19 question.

20 Q. (By Ms. Burch) What methodologies and techniques have
21 been used in the Tillamook Bay watershed to identify sources?

22 A. Are you asking methods and techniques that I have used or
23 others have used?

24 Q. Both.

25 A. Techniques that I have used, the Tillamook watershed,

1 again, this is quite different from what we see in the Illinois
2 River Watershed in terms of the headwaters of the rivers, at
3 least four of the five rivers that flow into that bay are
4 exclusively forested, so there are no human or livestock
5 impacts of any kind on the rivers. And then as you move down,
6 lower down on the systems, then you move into areas that
7 include agricultural development, a lot of that is dairy cow
8 activity. There are also some beef cows and hobby horses and
9 that sort of things, a lot of septic systems. And then two of
10 the rivers flow through the City of Tillamook, so we have urban
11 influence coming in from the city. So the land uses are much
12 more compartmentalized in at least four of the five rivers,
13 less so in some of river itself. And we've done a lot of work
14 just to look at collecting samples at the interface between
15 different land uses and trying to see how concentrations and
16 loads of bacteria and other constituents change in those rivers
17 as you move downstream. So we've done quite a lot of that.
18 That would be the first.

19 The second type of study that I've conducted, and I've
20 conducted this on the Tillamook, Trask and Wilson Rivers.
21 These would be that three that are the most problematic with
22 respect to bacteria, they have the highest concentrations and
23 loads of the five rivers. What I've done there is conducted
24 studies. Mine were mostly focused on the Tillamook and Trask
25 Rivers, although I helped to write the report on the Wilson

1 River water, where we collected frequent interval sampling
2 during storm events, and so we sampled up to 30 different
3 locations in a rather narrow band within the agricultural,
4 urban and suburban, rural residential land use areas, and
5 looking at the ways that bacteria concentrations and loads
6 changed as you move down the river system, and outlining the
7 contributing areas of watershed that flow into those reaches of
8 river and then trying to figure out what land uses are embedded
9 in these contributing areas and which land uses are
10 contributing which proportions of the various contaminants of
11 interest, including fecal coliform bacteria. So those would be
12 two of the primary source type studies I've done.

13 I've also done related studies in the Tillamook basin
14 to look at sources. One would be a demonstration project
15 working with the farmers in the entire watershed. We had three
16 farm owners in the watershed. I was able to make arrangements
17 to work with two of them and what we did was to change
18 management procedures and change the --

19 Q. I don't mean to interrupt you. That's a little bit off
20 topic in terms of what techniques were used to identify
21 sources. Other than the work that you described that you did
22 --

23 MR. GEORGE: I apologize. The witness was being
24 responsive to the question, which was what type of source
25 tracking methods have you used. I think he was describing his

1 last one. I ask that he be allowed to answer.

2 MS. BURCH: It didn't sound like a source tracking.

3 THE COURT: I think he was attempting to be responsive
4 to your question. Anything else in response there, Doctor?

5 A. Well, the study that I was trying to describe was actually
6 working with the farmers to reduce the things that we think
7 contribute bacterial pollution and then actually measuring how
8 effective it was. And so that was focused on the particular
9 land use of dairy farming and pasturing activities. We had
10 beef cattle, we had dairy cattle and a very active dairy in the
11 watershed. And by working with the landowners to have manure
12 spreading setbacks away from the streams, building fences,
13 planting riparian vegetation, enhancing wetlands, putting berm
14 systems in to retard the flow of water into the streams,
15 changing how water was routed, putting in new culverts where
16 they were inadequate and would cause flooding of the fields, a
17 number of low tech solutions to the problem and then actually
18 quantify how much we could reduce the bacteria, and in doing
19 that, we reduced fecal coliform bacteria by about 75 percent
20 even though we only worked with two out of the three farmers,
21 the third one wasn't willing to work with us. So I think that
22 we're focused on the source and trying to remediate that source
23 of fecal bacteria.

24 THE COURT: I think Ms. Burch's next question is going
25 to focus on source tracking; correct?

1 Q. (By Ms. Burch) Yes, that was my question. Are there any
2 source tracking methodologies that have been used in the
3 Tillamook watershed?

4 A. Yes, there have been two that I'm aware of. The first one
5 is bacterial antibiotic resistance work, and I actually
6 collected the samples that were used in that and consulted with
7 the scientists at Oregon State University who did that work,
8 although I wasn't directly involved in interpreting the data or
9 doing any of the bacteriological analyses. So that was done to
10 try to discriminate. And the basis for that is that these bugs
11 that are out there are used to being exposed to certain
12 antibiotics. If they are bugs that come out of people they're
13 used to being exposed to people antibiotics, if they are bugs
14 from cows, they're exposed to cow antibiotics and so on. And
15 so looking at the suite of resistance of the bacteria to a
16 whole group of antibiotics, you can get some insight in terms
17 of whether they came out of people or came out of cows or came
18 out of wildlife. So that study was conducted.

19 And then there was also a DNA study that was
20 conducted. I was not involved in that at all. I had
21 interactions with agency people who were involved with it, had
22 discussions, but I have no firsthand knowledge about what came
23 out of that study and I have not read the report that came out
24 of that study.

25 Q. Okay. So do you know whether anybody in Oregon is relying

1 on that to make decisions on what ought to happen in the
2 watershed?

3 A. All I can provide is some hearsay. I'm not sure you want
4 my hearsay. I don't have any definitive answer to that
5 question.

6 Q. You don't know?

7 A. I don't know the answer to that question myself, no.

8 Q. Okay. That's fine. I'm going to give you what I have
9 marked here as Exhibit 602. Do you recognize that?

10 A. Yes. This appears to be a report that I wrote.

11 Q. Did you -- is it accurate to say you did an investigation
12 or an evaluation of fecal coliform bacteria levels in runoff
13 from manure-applied fields?

14 A. I think that would be an accurate characterization.

15 Q. Did you find that in the absence of filter strips, you
16 could have high levels of fecal coliform bacteria runoff?

17 A. What I found was if you apply, in this case dairy cow
18 manure to pastureland and there's no vegetative buffer at all
19 between where you apply the manure and where you collect runoff
20 samples, that there would be high levels of fecal coliform
21 bacteria when you were able to actually generate and collect
22 that runoff, yes.

23 Q. And from my reading of your work, you indicated that
24 levels in excess of 200 CFU per 100 milliliters were what you
25 were calling high?

1 A. I don't remember characterizing values as high or not
2 high. I know there was some analyses that I did where I
3 restricted the analyses -- I'm pretty sure there were where I
4 restricted the analyses to that cutoff. I don't remember
5 characterizing anything as high or not high.

6 Q. You don't remember saying that you saw very high levels of
7 fecal coliform bacteria in runoff?

8 A. I may have said that. I don't remember if I had a
9 particular cutoff that characterized as high or not.

10 Q. Could you turn to Page 44, please?

11 A. Yes, I have it.

12 Q. Could you read the first two sentences under the section
13 called discussion?

14 A. Yes. "Runoff from the manure-treated cells that contained
15 no filter strip," and in parenthesis, "zero filter strip cells,
16 had very high concentrations of FCB." That would be fecal
17 coliform bacteria. "Median values for the gentle slope cell
18 and for the silty soil site cell both exceeded 10,000 CFUs per
19 100 mil."

20 Q. Do you think 10,000 CFU per 100 mil is a high level of
21 bacteria, fecal coliform bacteria in runoff?

22 A. It depends on where it is. If you are collecting a small
23 volume of runoff immediately adjacent to an area that has had
24 dairy cow manure applied, I wouldn't consider it to be
25 particularly high, no.

1 Q. You wouldn't consider it to be a high level?

2 A. Not for that kind of sample location. What I would
3 consider high would very much depend on what I was sampling.
4 Am I sampling drinking water, am I sampling primary contact
5 body -- I mean body contact recreation water, am I sampling
6 some runoff that came from a few inches away from where I
7 applied dairy cow manure? I mean, what I would consider high
8 would vary depending on the context of what I was looking at.

9 Q. So you expect to see high levels at the edge of field in
10 runoff samples?

11 A. I had applied fresh dairy cow manure within a few inches
12 of where those samples were collected. If I didn't find
13 bacteria there, then I would have been very surprised.

14 Q. Right. Did you actually -- you were actually doing this
15 in the field, you were land applying dairy manure and then
16 collecting samples in the field; right?

17 A. That's correct. I hauled thousands of gallons of dairy
18 cow manure myself.

19 Q. That sounds like a lot of fun.

20 A. Yes, it was actually.

21 Q. And so you expect to see levels -- the median value in
22 runoff after you did that was 10,000 colonies per 100
23 milliliter for fecal coliform?

24 A. I think that's what I just read. That would make sense.

25 Q. Okay. So could you turn to Page 9 of your report? Could

1 you read -- in the third paragraph, could you read the second
2 sentence?

3 A. The third paragraph, second sentence. "Subsequent surface
4 runoff during rainstorms can contaminate stream and estuarine
5 resources with enteric bacteria." And it references Entry, et
6 al. 2000.

7 Q. Is the Tillamook Bay watershed a recreational watershed?

8 A. I would consider it to be a recreational watershed, yes.

9 Q. People swim in it, recreate in it?

10 A. Well, there's really not much swimming that goes on.
11 There's a lot of canoeing and kayaking in certain areas and a
12 lot of fishing and boating goes on.

13 Q. Okay.

14 A. Bird watching.

15 Q. So recreational primary body contact standards apply in
16 those waters?

17 A. The most important standards would be the primary body
18 contact recreation standards in the fresh water portions of the
19 watershed if that's what you are referring to, yes.

20 Q. Okay. In that same paragraph you say, "The movement of
21 bacteria from pasture to surface water is an important
22 environmental concern." Do you agree?

23 A. I think that it can definitely be an important concern.
24 It's important that we structure the application of manure on
25 pasturelands in ways that it will not contribute runoff to a

1 stream system. That's the reason in my view for a lot of the
2 regulations that we have here in Oklahoma and Arkansas as well
3 as regulations that have been coming online nationwide and will
4 probably continue to come online nationwide.

5 Q. The next sentence after the one I just read, you say these
6 fresh -- "These same fresh estuarine surface water and" -- I'm
7 sorry. "These same fresh and estuarine surface waters are used
8 for recreational activities, and therefore high concentrations
9 of fecal bacteria pose a health risk." Did you write that
10 statement?

11 A. Yes, I'm sure I did.

12 Q. And you agree with it then?

13 A. Well, I think that again we have to put it in context. In
14 the case of Tillamook, we really would be looking at secondary
15 body contact as the issue. I'm not sure if these rivers are
16 classified for the beneficial use as primary or secondary. I
17 think they're classified as primary. So you would have perhaps
18 primary body contact going on, certainly a lot of secondary
19 body contact going on, and then there would be two standard
20 values that would apply to those different types of recreation.

21 Q. Are you talking about in the Illinois River Watershed?

22 A. No. I'm talking about in the Tillamook Bay Watershed.

23 Q. Okay. Because it sounded almost exactly like the same
24 thing in the Illinois River Watershed to me. We have two
25 different water quality standards for the Illinois River; is

1 that correct -- I mean three?

2 A. My understanding is that in the state of Arkansas that
3 both the primary and secondary body contact standards apply to
4 the fecal coliform bacteria index, and that in Oklahoma it's
5 different. There is no secondary body contact standard that is
6 in effect that I'm aware. I've not seen reference to it, but
7 there is the primary body contact recreation standards, and in
8 Oklahoma it can be determined by one of three fecal indicator
9 bacteria types.

10 Q. Did you read the water quality standards for Oklahoma?

11 A. I have seen them.

12 Q. And you didn't see that there's a secondary body contact
13 recreation standard?

14 A. I've seen reference to the fact that there is one, but
15 then I never see reference anywhere to what the number is. So
16 it's confusing to me exactly what Oklahoma is doing in terms of
17 secondary body contact. It's clear for primary, but it's not
18 clear to me the secondary in Oklahoma.

19 Q. Okay. Have you seen any research similar to what you did
20 in the Tillamook watershed that's specific to poultry waste?

21 A. I've seen research of this general type. I don't remember
22 if any of it was specific to poultry, but certainly there have
23 been studies published and that I have read that used manure
24 applications on treatment cells as I did. All the studies like
25 that that I've read used artificial irrigation systems to

1 provide their rain, and that's an important point because what
2 I did in Tillamook was to sample during natural rainstorms,
3 which is difficult and challenging, but it provides, in my
4 view, an accurate representation of what actually occurs in the
5 field. The other studies of this type that I've read use quite
6 high applications of artificial rain in order to force overland
7 flow, which is a type of runoff, and it's a type of runoff that
8 contributes -- potentially contributes to bacteria. And they
9 applied levels of artificial rain that were very high compared
10 to what Mother Nature provides.

11 Q. Okay. I'm going to go through some of these studies with
12 you that were in your considered materials or maybe even
13 referenced in the paper that we just went through on Exhibit
14 602. I'm going to ask you maybe to read some language. I may
15 ask you some yes or no questions. The Judge is going to hold
16 me to a really tight schedule, I would guess, and so I need to
17 move quickly. So let me hand you what I have marked as 591.
18 Could you -- can you locate the highlighted language that is on
19 Page 1323?

20 A. 1323, yes. "Non-point source pollution in agroecosystems
21 already routinely exceeds water quality standards for fecal
22 indicator bacteria." And it cites the paper by Crane, et al,
23 in 1983.

24 Q. Could you turn to Page 1325 and read the highlighted
25 language on there?

1 A. 1325. "Schellinger and Clausen, 1992, reported that 25
2 percent of runoff losses occurred through subsurface flow. In
3 environments with shallow soil, such as central Kentucky fecal
4 contamination may be transferred rapidly from surface flow to
5 shallow groundwater.

6 Q. Do you know whether the Illinois River Watershed has
7 shallow soils?

8 A. Well, I can tell you what I know about that.

9 Q. I just want a yes or no answer. Do you know?

10 A. I have -- I don't have the level of detail that I would
11 like to have to answer that question thoroughly, but I have a
12 fair amount of information on what the soil depths are that I
13 can tell you about if you'd like.

14 Q. If you can't answer --

15 MR. GEORGE: Your Honor, I apologize. I believe we're
16 outside the scope of direct. This witness has not offend an
17 opinion about soil depth in the Illinois River Watershed or
18 groundwater.

19 THE COURT: Ms. Burch, any response?

20 MS. BURCH: The witness is here to talk about his
21 opinions about whether poultry waste is or is not a source of
22 contamination in the watershed. I think that in order to have
23 an opinion on that, you need to understand something about the
24 watershed.

25 THE COURT: Well, I don't believe he has opined

1 relative to the thickness of soil. Just one second, let me
2 take a look at my notes here. I just noted a note that I made
3 to myself, "not filtered by soil," but that was his statement
4 about storm water runoff. I believe the objection is good.
5 Sustained. Let's take a recess. It's 3:20. We'll be in
6 recess for about 10 minutes.

7 (Recess.)

8 THE COURT: Be seated, please. Twenty-eight minutes,
9 Ms. Burch.

10 MS. BURCH: Do we get extra time for good behavior?
11 No. Okay.

12 THE COURT: I'm sentencing tomorrow, Ms. Burch,
13 tomorrow morning.

14 MS. BURCH: Okay. I'm going to go fast.

15 Q. (By Ms. Burch) We were just looking at a document marked
16 Exhibit 591?

17 A. Yes.

18 Q. Could you turn to Page 1327 on that document. And just
19 for context, we were talking about a paper that did some
20 research into runoff -- fecal coliform runoff values from
21 poultry waste; is that correct?

22 A. It's fecal runoff values. I'm trying to see if it was
23 poultry. Yes, poultry waste.

24 Q. Okay.

25 A. Poultry manure.

1 Q. So do you see the highlighted language on Page 1327?

2 A. 1327, yes.

3 Q. Would you mind reading that into the record, please?

4 A. Flow weighted mean fecal coliform and fecal Streptococci
5 concentrations in runoff from all plots always exceeded ten to
6 the fifth CFUs per hundred mil, Table 1. These concentrations
7 are at least a thousand times higher than the standard for
8 fecal contamination of primary contact water," in parenthesis,
9 "200 fecal coliform per hundred mil," close parenthesis, "in
10 Kentucky. Although 90 percent of the fecal bacteria mass was
11 trapped in some cases, Table 2, the amount trapped was
12 irrelevant in terms of water quality standards because the
13 criteria are based on population not mass. Based on the
14 criterion used for fecal contamination, filter strips were
15 inadequate to manage water quality."

16 Q. Okay. I'm going to bring you an exhibit I have marked as
17 593. At the bottom is what is called a Bates number. Do you
18 see that Sullivan something?

19 A. Yes, I do.

20 Q. Could you turn to Sullivan 1299. First of all, do you
21 recognize that document?

22 A. Let me just look at it for one minute here. Yes, I do.

23 Q. That was in your considered materials?

24 A. Yes, I believe it was.

25 Q. And that's a study, again, of runoff amounts in

1 land-applied poultry litter, fecal coliform?

2 A. I think it involves the same people. Yes, Dr. Coyne was
3 the principal investigator on both of these papers.

4 Q. Could you turn to Page 1299 then?

5 MR. GEORGE: Your Honor, if I might, and I apologize.
6 Before we get into this and future papers, this witness has not
7 offered an opinion on runoff from poultry waste. He talked
8 about multiple other sources in his direct testimony and in his
9 affidavit, but in light of that I believe this whole line of
10 questioning is outside the scope.

11 THE COURT: Ms. Burch?

12 MS. BURCH: He again has testified that he -- that he
13 has looked at sources in the watershed and has rendered opinion
14 about which sources may be responsible for fecal coliform
15 levels, and he has considered this material, and he was
16 rendering his opinion, and I just want to ask him a question
17 about it.

18 THE COURT: Overruled.

19 Q. (By Ms. Burch) Sir, could you read that language that's
20 highlighted on Page 1299?

21 A. Well, the first point of highlights says "6.3 times 10 to
22 the ninth CFUs." And then there's a paragraph that's
23 highlighted and it says, "Fecal coliform growth in litter was
24 detected after the first rain indicating that moisture was a
25 factor affecting fecal coliform concentrations in the land

1 waste. Long dry periods are needed between application and
2 first runoff to ensure some bacterial die-off." In
3 parenthesis, "Walker, et al. 1990. The implications of this
4 are that when litter is applied during wet periods or with
5 impending rain, not only is the probability of litter
6 constituent runoff are increased, but bacterial survival is
7 facilitated."

8 This study suffers from the same limitations as the
9 previous study that came out of the same research group.

10 Q. I understand. Have you done any research on the amount of
11 fecal coliform runoff, the amount of fecal coliform in runoff
12 from poultry-manure applied fields?

13 A. In terms of a field project you mean?

14 Q. Yes.

15 A. I've not conducted a field project on that, no.

16 Q. Okay. Do you have still PID 4 in front of you? It's the
17 map of the state of Oklahoma with the 303(d) listed streams.

18 A. No, I don't believe I do.

19 Q. Let me hand it to you. Did you evaluate how many stream
20 miles are impaired by fecal bacteria in Oklahoma?

21 A. Yes, I tabulated that. I'm not sure if I can remember the
22 exact numbers, but I can probably come pretty close.

23 Q. Okay.

24 A. Enterococci it was -- I think it was 5,800, something like
25 that. E. Coli and fecal coliforms were lower, in the range of

1 maybe 3,000 or 2,000 miles, something like that, in the State
2 of Oklahoma.

3 Q. Okay. So I'm going to show you what I have marked as
4 State's Exhibit 573. Do you recognize that document?

5 A. Yes, I do.

6 MR. GEORGE: Your Honor, I apologize. I haven't seen
7 the exhibit yet. Thank you.

8 Q. (By Ms. Burch) Did you create that document?

9 A. Yes. It was created under my direction.

10 Q. And how many miles did you indicate on there are impaired
11 by all three of the fecal indicator bacteria?

12 A. It was 6,108 miles.

13 Q. Do you know how many total stream miles there are in the
14 State of Oklahoma?

15 A. No.

16 Q. You didn't undertake to evaluate that?

17 A. No.

18 Q. I'm going to give you what I have marked here as -- well,
19 actually it's defendants' Exhibit PI 91. Do you recognize that
20 document?

21 A. Yes, I have seen this recently.

22 Q. Could you turn to Page 18, or it's marked at the bottom
23 910021. It's the last page of the exhibit.

24 A. Yes, I've got it.

25 Q. Does that indicate in that table how many stream miles

1 there are in the state of Oklahoma?

2 A. Well, it says total number of river and stream miles, and
3 it lists 78,778. And then it breaks it down by perennial,
4 intermittent, canals, ditches and river border miles.

5 Q. So it says total number of river and stream miles is
6 78,778?

7 A. That's what it says.

8 Q. And if 6,108 river miles are impaired by bacteria, would
9 you agree that's roughly 8 percent? Can you do that math in
10 your head?

11 A. That sounds like it's probably pretty close.

12 MS. BURCH: Could you get PI 229.

13 Q. I'm going to -- you probably have a copy of your
14 affidavit, but I'm going to bring you a copy anyway, PI 229.

15 A. Okay.

16 Q. I believe you showed earlier -- it was up on, actually up
17 on the screen a second ago, but you undertook to look at
18 concentrations of Enterococcus, fecal coliform and E. Coli
19 across the state, and you generated a series of maps; is that
20 correct?

21 A. That's correct.

22 Q. Are those attached to your affidavit as C, D and E? Would
23 you mind looking?

24 A. C, D and E, yes, that's correct.

25 Q. Okay. Would you turn to D?

1 A. Yes.

2 Q. What data did you use to generate that map?

3 A. Data from the EPA STORET database for the period 2001
4 through 2006, restricted to the recreational period May 1
5 through September 30th.

6 Q. Do you know whether USGS data is included in the STORET
7 database?

8 A. They're not.

9 Q. They're not. Did you review USGS data in this case?

10 A. Not for the state of -- well, I did look at some USGS data
11 for the state of Oklahoma before I did this and determined that
12 I didn't have enough sampling locations to evaluate the spatial
13 patterns across the state, and then that's when I went to
14 STORET.

15 Q. Okay. But you didn't include the USGS data for the
16 Illinois River in your analysis of the information about
17 contamination of the Illinois River Watershed?

18 A. Oh, I certainly included that in a number of my analyses,
19 but for the purposes of trying to evaluate the spatial patterns
20 across the state of Oklahoma, for that objective I would use a
21 common data source for all areas, including the Illinois River
22 and other parts of the state, so I'm comparing apples with
23 apples, and the database that I had available to depict the
24 spatial patterns in bacteria concentration was the STORET
25 database because we had enough samples to allow me to do that.

1 Q. Okay. So the STORET database is actually a conglomeration
2 of a bunch of different samples from a bunch of different
3 agencies; isn't it?

4 A. That's right. In this case most of the data, I believe it
5 was 90 percent or 95 percent, in that range, most of the data
6 came from three sources. It was Oklahoma DEQ, Oklahoma Water
7 Resources Board and the Oklahoma Conservation Commission. They
8 were responsible for almost all the data that went into this
9 particular analysis.

10 Q. And so are you aware of what monitoring is done in the
11 Illinois River Watershed? Are you aware that most of the main
12 stem monitoring is done by USGS?

13 A. USGS does quite a lot of monitoring. I've seen a fair
14 amount of data, and actually earlier on worked up some of the
15 data from those other agencies. So there are a number of
16 agencies involved in collecting data in the Illinois River,
17 including the USGS.

18 Q. Yeah, but are you aware of the fact that most of the
19 monitoring on the main stems is done by the USGS?

20 A. I'm not aware that most of it is. I've never really
21 looked at specifically how much on the main stem was done by
22 one agency versus the another or the other parts of the
23 watershed by one agency versus the another, so I really can't
24 tell you what the answer to that question is.

25 Q. Okay.

1 A. But I can agree with you that USGS has collected data.

2 Q. You agree that USGS has collected data. Would you agree
3 that USGS has collected a substantial amount of data for the
4 Illinois River Watershed?

5 A. It was quite a bit, yes.

6 Q. Okay, and you didn't include any of that data in your
7 analysis of bacteria concentration in either C, D or E?

8 A. Oh, I included that data in very many of my analyses, but
9 for this particular purpose of looking at spatial patterns
10 across Oklahoma it would have been improper for me to include
11 the data because I wanted to compare apples with apples and use
12 a common data source for inside and outside the Illinois River
13 Watershed. That was the point of the analysis was, is the
14 Illinois River Watershed somehow different from elsewhere in
15 Oklahoma? Does it have significantly higher fecal indicator
16 bacteria concentrations than the rest of the state? My answer
17 was, no, it doesn't. But to derive that answer, I would have
18 to use a common data source that wasn't biasing my analysis in
19 some way.

20 Q. How is EPA STORET data that has a data from a myriad of
21 different agencies in it, some tribal governments, a common
22 data source?

23 A. Because they're treating the Illinois River Watershed the
24 same as they're treating the rest of the state. It's one
25 source of the data for me to use in my analysis. And if they

1 collected data from an Oklahoma agency in the Illinois River
2 Watershed they would have collected, I would assume, the same
3 data from the same agency other places within the state.
4 That's what allows me to have a common data source as the basis
5 for my geographical analysis.

6 Q. What happened when you actually did the same analysis
7 using the USGS data collected in the Illinois River Watershed
8 for fecal coliform?

9 A. I don't remember exactly how many sites there were, but I
10 do remember my conclusion when I did that was this is not
11 enough sites to go forward with this work. I don't remember
12 how many it was. It was certainly not very many. In this case
13 I've got, I believe it's about 10,000 data points, there's
14 quite a bit of data. Remember that this is the geomean
15 calculation. We have to have at least five samples from each
16 site in order to even use it, and it requires quite a lot of
17 data to establish spatial patterns across the state.

18 Q. Okay. If you look at Exhibit D again, you show, if I'm
19 reading this correctly, absolutely no exceedances of the
20 geometric mean standard in the Illinois River Watershed?

21 A. I'm sorry. Just a minute. So I'm looking at Exhibit D,
22 the fecal coliforms. That's correct. And actually my
23 understanding is that that would fit with the other data that
24 you're asking me about because I believe the only stream reach
25 in the Illinois River Watershed that is 303(d) listed for fecal

1 coliforms occurs in Arkansas, and this is a map of just
2 Oklahoma data. So I'm not showing any Arkansas data in this
3 map at all. I don't think that there's a stream reach in
4 Oklahoma that's listed for fecal coliform bacteria. I could be
5 wrong on that.

6 Q. I'm going to give you what I have marked as State's
7 Exhibit 578. Do you recognize that document?

8 A. Yes. This is the graphic that I was referring to, the
9 first analysis that I did looking at USGS data, and from this,
10 I judged that I did not have a sufficient density of sample
11 points to conduct a spatial analysis to try to determine if the
12 places in Oklahoma that had high poultry litter applications
13 were different from those that did not have high poultry, and
14 if the concentrations in the Illinois River Watershed were
15 different than elsewhere in Oklahoma. I judged that there were
16 not enough data points to do a rigorous analysis to evaluate my
17 questions.

18 Q. Okay. So you heard the judge tell me I had not very much
19 time; correct?

20 A. Yes. I'm doing the best I can to be concise.

21 Q. I understand. If I ask you a yes or no question, could
22 you just say yes or no?

23 A. I think it will depend on if it's a question that will
24 allow me to say yes or no. If I can, I certainly will.

25 Q. I would appreciate it.

1 A. I'll do my best, I promise.

2 Q. I don't want to distract from this, but I just asked you
3 if you recognized the document, which I think you could have
4 said yes or no to.

5 A. I'm sorry, and you're right. The answer is, yes, I do
6 recognize it.

7 Q. Okay. Do you see that that graphic shows exceedances of
8 fecal coliform standards in the Illinois River Watershed?

9 A. Well, the question of whether it shows exceedances, I'm
10 not sure because I'm not sure what the scale bar is on this.

11 Q. Well, you created it, didn't you?

12 A. Yes, I did. But, again, I created it to see, first, if I
13 had enough data to move forward with an analysis of USGS. The
14 answer was, no, I did not have enough data to move forward, so
15 I moved on to my next choice, which was STORET. So I don't
16 know that there's a scale bar on here to tell me what's above
17 standard and what isn't. I couldn't say that with confidence,
18 no.

19 Q. You can't tell?

20 A. No.

21 Q. Okay. So let's turn to Exhibit F of your affidavit then.

22 A. Exhibit F, okay. Yes, I have it.

23 Q. Does that exhibit show any exceedances of fecal coliform
24 standards in the Illinois River Watershed?

25 A. Exhibit F shows exceedances primarily during high flow

1 conditions for both fecal coliform -- I'm sorry. Did you ask
2 about E. Coli or just fecal?

3 Q. Just fecal coliform.

4 A. Just fecal. It shows exceedances, a couple of exceedances
5 of the geomean in single sample standards at low and moderate
6 flows, and then it shows many more exceedances at high flows,
7 yes.

8 Q. So we can agree that in the Illinois River Watershed fecal
9 coliform standards are exceeded?

10 A. We can agree that during high flow that there are samples
11 collected that are above the standards, that's correct.

12 Q. Okay. Great. So on the original exhibit that we were
13 talking about where you mapped the concentrations of fecal
14 coliform across the state, you showed no exceedances of fecal
15 coliform criteria in the Illinois River?

16 A. That's correct and, again, that was based on using a
17 geomean of five samples, which is what's required to have a
18 listing. This is a scatter plot that shows individual samples,
19 so there's no geomean calculation. So it's not exactly
20 comparable, but, yes.

21 Q. Okay. When you say that you had five samples to calculate
22 a geographic mean for this map, did you have five samples taken
23 in 30 days for each of the locations on your map?

24 A. No, I didn't. In that case I wasn't trying to do
25 calculations that would support or not support a standard, but

1 rather mathematically not wanting to calculate a geomean
2 without at least five samples. It would be fairly meaningless,
3 I think, to do that, and even five is pretty skimpy. You need
4 to have a fair number of samples to do that.

5 Q. Okay. So we have a map that shows us that five samples
6 during a five-year period -- you have the geomean of five
7 samples taken during a five-year period?

8 A. I'm sorry, what?

9 Q. You calculated your geometric mean not using the 30-day
10 limitation on the data?

11 A. For the spatial map of Oklahoma?

12 Q. Yes.

13 A. No, the 30-day limitation was not included in that
14 analysis. It was an analysis to represent what the levels
15 looked like across the state of Oklahoma and whether or not
16 they had any correlation with poultry industry activities or
17 any relationship to what we see in the Illinois River
18 Watershed.

19 Q. Did you use that same technique for the map that you did
20 for E. Coli and Enterococcus as well?

21 A. Yes, I did.

22 Q. Do you agree with me that Enterococcus levels exceed water
23 quality standards throughout the Illinois River Watershed at
24 various flow regimes?

25 A. I agree that Enterococcus concentrations exceed the

1 standards pretty much everywhere. It was 92 percent of all the
2 samples I looked at in Oklahoma on that mapping technique, and
3 I heard Dr. Myoda testify it was 97 percent of all the streams
4 in Maryland. High Enterococcus is very ubiquitous.

5 Q. Okay. I just wanted to know, do you agree that
6 Enterococcus standards are exceeded in the Illinois River
7 Watershed in many locations and in many flow regimes?

8 A. I believe they're exceeded pretty much everywhere in all
9 locations and all flow regimes, the Illinois River and outside
10 the Illinois River, yes.

11 Q. Okay. And you did an analysis that is PID 9 or Exhibit F
12 to your affidavit?

13 A. Exhibit F, I thought that was the one we were just talking
14 about. I'm sorry.

15 Q. It is. Do you see that you establish the -- would you
16 agree with me you established what you call a high flow value
17 there at roughly 600 CFS?

18 A. Yes.

19 Q. Do you have any idea what level the river is at in terms
20 of the gauge height when flow is at 600 CFS at the Watts
21 location?

22 A. I have not checked that, no.

23 Q. Wouldn't that be important if you're making statements
24 about whether or not people are going to be on the river?

25 A. I don't know how important that is. I don't know to what

1 extent the people would check the river stage. I suppose in
2 some situations that would be something that they would want to
3 look at. In terms of recreation on the river, I'm thinking
4 more in terms of the likelihood that people, and I suppose in
5 many cases it's families, are going to be out on the river
6 during rainy periods versus not rainy periods. So that's the
7 point of comparison that I was making rather than river stage
8 specifically, although river stage certainly could enter into
9 it as well.

10 Q. I'm going to hand you what I've marked State's Exhibit
11 581. Do you recognize that as USGS data?

12 A. Well, it says USGS at the top. I don't remember seeing
13 this before, but it does say USGS.

14 Q. You said you work with USGS data all the time; right?

15 A. I work with USGS data quite a bit, yes.

16 Q. Are you familiar with these rating curves that gauge
17 height and flow, pretty standard USGS dataset?

18 A. I'm generally familiar with that. I'm not sure I would be
19 able to reconstruct one, but the relationship between stage
20 height and flow, I'm definitely familiar with that. I mean
21 that's how we estimate flow at different times where we have a
22 stream stage recorder. We use that in relationship to estimate
23 the flow.

24 Q. Okay. Do you see that this is that type of information
25 for the Illinois River near Watts?

1 A. Well, let me see. It does say Illinois River near Watts,
2 and it has discharge and it has gauge height. Yes.

3 Q. Okay. Could you find a value on there that's roughly
4 equivalent to 600 CFS?

5 MR. GEORGE: I apologize, Your Honor. Objection, lack
6 of foundation. The witness has testified that it's not
7 information that he considered and it's a document he's not
8 seen.

9 MS. BURCH: It's the type of information he says he
10 relies on all the time when he does water quality modeling.

11 THE COURT: We'll allow it. Overruled.

12 A. I'm sorry, what was the question again?

13 Q. (By Ms. Burch) Can you look on this chart and identify
14 the gauge height and feet associated with a flow of roughly 600
15 CFS?

16 A. I'm not sure what the .00 or the .01 and .02, I'm not sure
17 what those columns represent, so I don't know where to find
18 this.

19 Q. You don't know how to use this information?

20 A. I have not used a spreadsheet like this personally, no. I
21 mean, I understand the concept of how we calculate discharge
22 from stage, and we do that routinely on various studies, but I
23 have a data analyst do that. I don't do that myself.

24 Q. Do you recognize that?

25 A. Well, again, it's headed USGS, Illinois River near Watts,

1 provisional data subject to revision. So I don't believe it's
2 anything I've seen before.

3 Q. You didn't go to the Web site at USGS and download the
4 stage discharge flow information?

5 A. I had discharge information from USGS that I used in many
6 of my analyses. I don't believe that the stage data were
7 downloaded unless they came along with it automatically. The
8 analyses that I did for this case that involved flow data, I
9 had those analyses done by a data analyst who would have gone
10 to USGS. I don't know, I don't think he got it from the Web
11 site. I think he had someone at USGS send it to him directly,
12 it was either one of those, and then he would have been the one
13 who actually did the computer analyses of the data. That's why
14 I have data analysts to do that for me.

15 Q. Okay. That's great. So are you familiar with the USGS
16 Web site to get data?

17 A. I've never gone to the USGS Web site to get data. Again,
18 I have a number of data analysts that work for me, and that's
19 why I have them.

20 Q. Did you review the CDM water quality monitoring data in
21 this case?

22 A. The monitoring data collected for this case, yes, I did.

23 Q. Okay. I'm going to hand you what is marked as Exhibit
24 584.

25 A. Okay.

1 Q. Let me ask -- I'm afraid I'm short on time. Did you do
2 anything to investigate the appropriate flow or gauge height
3 when people are actually on the Illinois River?

4 A. What I did was to listen to Dr. Caneday's testimony when,
5 I believe what he said, it was quite awhile back, I believe
6 what he said was that the recreationists are not out there very
7 much during rainy periods. That was the primary basis for
8 that. Now, in terms of are you talking about dividing things
9 up into high flow versus non-high flow conditions?

10 Q. Sure.

11 A. What I did for that was basically divide the flow regime
12 into three portions. The lower 30 percent of annual average
13 discharge was considered to be low flow. The upper 30 percent
14 of annual average discharge was considered to be high flow, and
15 the middle 40 percent was considered to be moderate flow. So I
16 separated the flow regimes in ways that made intuitive sense to
17 compartmentalize the samples and try to evaluate under what
18 conditions was it more likely to be a rainy period where
19 recreation would be less likely versus periods that were less
20 rainy and had lower flows.

21 Q. Did you check any record at the Scenic Rivers Commission
22 to test your hypothesis to see whether people were on the river
23 when you predicted they were not?

24 A. I'm not aware that there were any data that would tell me
25 when people are on the river. I have seen some recommended

1 guidelines for safety concerns when they asked people to -- or
2 they recommend people not be on the river, I have seen those,
3 but I'm not aware of any data that would indicate under what
4 flow regimes people use the rivers. So, no, I don't know.

5 Q. And the guidelines you're talking about, it says people
6 are generally warned not to get on the river when the level is
7 nine and a half feet; is that correct?

8 A. As I remember, there were two levels of warning. I think
9 the first was either six or six and a half feet, and the second
10 was either nine or nine and a half feet, and there were two
11 levels of warning. I don't remember the specific wording on it
12 but, yes, I do remember seeing that.

13 Q. How many -- what's the flow in CFS when the gauge is at
14 nine foot six inches?

15 A. I don't know.

16 Q. Would you be surprised to know it's 8,210 CFS?

17 MR. GEORGE: Objection, lack of foundation.

18 THE COURT: Sustained.

19 MR. GEORGE: Your Honor, could I check the time? Mr.
20 Overton I'm sure is --

21 THE COURT: We're right of the time. I'm going to
22 give her a few minutes for little lengthy responses here.

23 MR. GEORGE: I understand.

24 THE COURT: Go ahead, Ms. Burch.

25 MS. BURCH: Thank you, Your Honor.

1 Q. (By Ms. Burch) Do you recognize what I just handed you as
2 State's Exhibit 590?

3 A. Yes, I do.

4 Q. Could you turn to the land use map there that's marked as
5 Sullivan 691.

6 A. Sullivan 691, just a minute, please. Yes, I have it.

7 Q. Is this some of the data that you used to create the land
8 use, land cover map that you talked about earlier? I think it
9 was Defendants' PI D13.

10 A. Well, I'm sorry, I'm not sure that I understand what the
11 question is. This does show that land use -- the land use
12 data.

13 Q. Okay. And did you create this?

14 A. It was created under my direction, yes.

15 Q. Okay. What is the largest land use in the Illinois River
16 Watershed?

17 A. It's pretty similar between forest and agriculture. I
18 really don't remember which one is larger. Those are the two
19 -- the two most prominent land uses would be forest -- well,
20 forest, including other natural or semi-natural vegetation and
21 agriculture land, and then urban. Urban would be third on the
22 list.

23 Q. Okay. Let's look at the key down at the bottom of this
24 page that we're looking at.

25 A. Oh, yes, it does give the percentages there, yes. The

1 forest, grassland and herbaceous would be 48 percent. So
2 that's a little bit higher than pasture/hay, which I'm calling
3 agricultural land. And then urban would be next.

4 Q. So pasture and hay is 42 percent of the land use in the
5 watershed?

6 A. Based on the USGS National Land Cover Dataset, that would
7 be correct.

8 Q. And urban is what percentage of the watershed?

9 A. Well, its' -- there's really two categories there.
10 There's a developed and there's an urban, and you probably
11 would want to combine those, and that would be 8 percent.

12 Q. Did you undertake any effort to identify how much poultry
13 waste was land applied on any of this pasture?

14 A. No, I did not.

15 Q. Did you undertake to investigate the locations of the
16 poultry houses in the watershed?

17 A. I didn't undertake that investigation, no.

18 Q. Did you do any sampling in the watershed to test your
19 theories about various sources?

20 A. Did I collect water samples, no.

21 Q. You did -- you testified about a calculation of sewage
22 bypasses that occurred in the Illinois River Watershed?

23 A. That's correct.

24 Q. Did you create that analysis yourself?

25 A. The initial analysis was done by Dr. Ron Jarman from Apex

1 Environmental, and then I summarized the result of his
2 analyses. He's the person I worked with in conjunction with
3 the effort for this case.

4 Q. Did you check his calculations?

5 A. I reviewed his calculations and discussed them with him.

6 Q. Did you check them?

7 A. Did I check them? No, I didn't.

8 Q. So you can't testify about whether or not they're
9 accurate?

10 A. Dr. Jarman is an engineer who has some experience in this
11 area, and I have no reason to think that they're not accurate,
12 but I did not perform any specific calculations to try to
13 verify the accuracy of the numbers that he compiled, no.

14 Q. Do you know whether he, in calculating the number of fecal
15 coliform, he used a value for total coliform?

16 MR. GEORGE: Objection, no foundation.

17 THE COURT: Sustained.

18 Q. (By Ms. Burch) Do you know what value he used to
19 calculate the amount of total coliform?

20 A. No, I don't. I think that in the table I presented, it
21 was presented as fecal coliform, not total coliform, but I
22 don't know what value he used in that.

23 Q. Do you know what the average value, the standard value
24 that's used by EPA and DEQ is for fecal coliform?

25 A. In what?

1 Q. In looking at raw sewage?

2 A. Well, I think that, I mean, raw sewage can be many
3 different things. A sewage bypass that includes rainwater
4 mixed in with the sewage pipe water would, I would think, would
5 be very, very different from the concentration in a broken
6 sewer pipe where you wouldn't have as much or maybe any of the
7 rainwater mixed in directly. So my guess would be that the
8 concentration could be enormously variable, but I haven't
9 looked at that many datasets, no.

10 Q. So do you know whether the value that was used in
11 calculating fecal coliform by Mr. Jarman is reliable?

12 A. No, I don't. I assume that it's reliable, but I think
13 there's a lot of variability in that. The purpose of that
14 exhibit was to illustrate that there are a number of bypasses,
15 and that it looks like that there often are quite high volumes
16 and quite high concentrations of bacteria in those, and that
17 that's an issue that is a source of contribution to the river,
18 not to try to put into quantitative context relative to some
19 other source. I would never do that with those data.

20 Q. So did you quantify any of the sources that you listed as
21 potential sources in the Illinois River Watershed?

22 A. I don't believe that we have the data to quantify any
23 sources in the Illinois River Watershed, whether it would be
24 done by me or anybody else. I don't believe the data exists to
25 do that.

1 Q. Did you undertake to quantify any of the sources in the
2 watershed?

3 A. Well, I suppose I probably set out to do that initially,
4 and as soon as I got involved in the analysis, specifically
5 with respect to the distribution of land uses, I realized that
6 there was no way I could do that. I would have liked to have
7 done that, certainly.

8 Q. The largest land use in the watershed besides forest is
9 pasture; correct?

10 A. That's correct.

11 Q. And isn't it true that poultry waste is land applied on
12 pasture in the Illinois River Watershed?

13 A. It's certainly land applied on some of the pastures, yes.

14 Q. What effort did you undertake to quantify how much poultry
15 waste was being land applied on those pastures and thus how
16 much was being contributed to the watershed?

17 A. Well, those are two different questions, but in terms of
18 how much poultry waste was land applied, I believe there have
19 been a number of people involved in this case who have looked
20 at that question. That's not my area of expertise or my area
21 of interest, to try to quantify how much litter is applied.
22 The focus of my work is the movement of materials off the
23 fields into surface waters and what happens in the surface
24 waters themselves. That's where I focused my research and
25 where I've focused my testimony here.

1 THE COURT: Ms. Burch, last two questions.

2 Q. (By Ms. Burch) I'm going to look at the exhibits to your
3 affidavit, and I'm going to --

4 MS. BURCH: This is going to be, if you'll indulge me,
5 Your Honor, I would just like to inquire as to the data sources
6 for each of his analysis. I can do it rather quickly if you
7 will. There's probably five charts.

8 THE COURT: Now, we've spoken about some of these
9 exhibits already.

10 MS. BURCH: I will cover only the ones I haven't
11 talked about already.

12 MR. GEORGE: Your Honor, by way of information, we do
13 have one other witness to put on today.

14 THE COURT: I understand. And the purpose of asking
15 for the data source here?

16 MS. BURCH: I think that it would become clear to the
17 Court that for each different analysis done of the data, a
18 different dataset was used.

19 THE COURT: All right, I think we've talked about some
20 of these datasets already. See if we can avoid overlap. Go
21 ahead.

22 MS. BURCH: Okay.

23 Q. On Exhibit F.

24 A. Yes.

25 Q. You didn't use any STORET data in that analysis; correct?

1 A. No, for the purposes of this analysis, I didn't need to
2 use STORET data. I could do the analysis with USGS data.

3 Q. And the USGS data that you used for this analysis is 2005
4 to 2007?

5 A. That's correct.

6 Q. Turn to Exhibit G.

7 A. Yes.

8 Q. What data did you use for that?

9 A. The purpose of this was to look at changes over time, so I
10 needed to use the period over time for which I had the data,
11 and that was 1996 to 2003.

12 Q. Is it USGS data?

13 A. Yes, it was.

14 Q. So on this one you used USGS data from 1996 to 2003?

15 A. That's correct.

16 Q. On the previous example we just covered, you used USGS
17 data from 2005 to 2007?

18 A. I'm sorry, I may have misspoken. The previous one was not
19 USGS data, it was State data, and I think that was my error.
20 Exhibit F is State data, and that was collected for the
21 purposes of this case by -- and I've lost the name of the
22 company, but between 2005 and 2007 is when they collected the
23 data for this case.

24 Q. Didn't that include USGS data, the CDM dataset that you
25 were provided?

1 A. The CDM dataset, I believe there are some USGS data in
2 that. I analyzed the CM -- I had the CDM dataset analyzed as
3 it was presented to me, the State database. And I believe
4 you're correct that there were some USGS collected data that
5 were part of that. I didn't attempt to include or exclude
6 them. We just analyzed the State dataset that was provided for
7 this case.

8 Q. So my question was, you had 2005 to 2007 USGS data
9 available to you?

10 A. No. The USGS data available to me was through 2003, I
11 think. I think that's correct. I'm almost positive that's
12 correct because for Exhibit G, I analyzed what I had for the
13 period of record, and it runs from 1996 to 2003. So I'm fairly
14 confident that I didn't have USGS data past 2003.

15 Q. You have the CDM dataset on an exhibit in front of you.
16 It's a spreadsheet with it that I gave you a moment ago.

17 MR. GEORGE: Your Honor, I apologize, but we're far
18 afield from just identifying sources of data.

19 THE COURT: I think so, with all due respect. The
20 objection is sustained.

21 Q. (By Ms. Burch) On defendants' PI D88, do you have that
22 with you?

23 A. Can you help me by saying what it looks like in the front?

24 Q. It's your chart of E. Coli data.

25 THE COURT: I really have to cut this. I thought we

1 were going to look at the data attached to his resume.

2 Redirect?

3 MR. GEORGE: No, Your Honor.

4 THE COURT: Very well. You may step down.

5 THE WITNESS: Thank you, Your Honor.

6 THE COURT: The defendants may call their next
7 witness.

8 MR. TUCKER: May it please the Court, I'd like to call
9 Dr. William Banner, please.

10 THE COURT: Dr. Banner.

11 WILLIAM BANNER

12 Called as a witness on behalf of the defendants, being first
13 duly sworn, testified as follows:

14 MR. BULLOCK: In order to expedite things, I will
15 stipulate as to Dr. Banner's expertise and knowledge as both a
16 toxicologist and as an intensive care physician and as a
17 pediatrician.

18 THE COURT: Thank you, sir.

19 MR. TUCKER: With that in mind, I'll shorten up my
20 questions about qualifications, if I may.

21 THE COURT: Very well. State your full name for the
22 record, please.

23 THE WITNESS: William Banner.

24 THE COURT: Mr. Tucker, you may inquire.

25 DIRECT EXAMINATION